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Communication apprehension, information technology fluency, and Internet access as factors affecting college students' participation in in-class and online discussion

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Communication apprehension, information technology fluency, and Internet access as factors affecting college students' participation in in-class and online discussion

by

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DEDICATION

To everyone who believed in me,

even when the completion of this dissertation

and subsequent degree seemed unlikely.

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Abstract

The purpose of this explanatory, non-experimental research study was to identify relationships between factors affecting college students' participation in class discussions, both in-class discussion and through an online threaded discussion forum. The predictor variables identified as factors were: apprehension of class participation, apprehension of computer-mediated communication, degree of information technology fluency, and Internet access (which provides a gateway to the online threaded discussion forum). The outcome variables were the amount of classroom discussion participation and the amount on online threaded discussion participation exhibited by the students.

Analyses of the data collected in this study revealed a *moderate* negative relationship (r = -.60) between the degree of classroom apprehension and the amount of classroom discussion participation the students exhibited which indicated that more apprehensive students participated less in the class discussion. This result was expected.

A preliminary analysis revealed a *moderate* positive relationship (r = .46) between students' online threaded discussion participation score and their cumulative grade-point average (GPA) which indicated that students with higher GPAs participated more in the online class discussion than those with lower GPAs. After controlling for GPA the three variables of students' computer-mediated communication apprehension, information technological fluency, and Internet access were not statistically significant predictors of the amount of online threaded discussion participation the students exhibited (R^2 = .045). This result was not expected.

Two additional research questions were asked to verify the integrity of the research model which was found to be valid. An additional analysis indicated that gender issues had not confounded the research model. Also, additional analysis did not support a possible conclusion that high-CCA (classroom communication apprehensive) students participated more in the online threaded discussion forum more than their low- or non- CCA peers.

CHAPTER I
INTRODUCTION

Background of the Study

The purpose of this explanatory, non-experimental research study was to determine relationships between factors affecting college students' participation in class discussions, both in-class discussion and through an online threaded discussion forum. The theoretical framework of this study is built upon the foundational concept of *New Learning*. *New Learning* is the word Simons, van der Linden, and Duffy (2000) used for "new kinds of learning processes and new instructional methods that are both wanted by society and stressed in psychological theory in many countries in the current period of time" (p. back cover). *New Learning* implies educational processes and methods, *not* students' learning outcomes (i.e., that the students learned something *new*). Terms like active learning, critical thinking, constructivism, collaborative learning, and knowledge construction are ubiquitous in current educational journals and in research conference presentations. The opportunity for students' exploration of ideas is facilitated by the students' participation in the in-class discussion and/or their participation in class discussion facilitated through an online threaded discussion forum. Providing students the opportunity to participate in the in-class and/or online discussion supports this premise of *New Learning*.

New Learning

Today's system of education continues through its never-ending process of change. New methods for student learning are garnering the attention of teachers and researchers, but are these methods really *new*? Are the methods drawn from educational theory this time any

different from previous methods and theories? Simons, van der Linden, and Duffy (2000) presented three differences:

> First, there is much more attention to the role of active, independent, and self-directed learning than ever before….
>
> Second, there is currently a much greater emphasis on the contribution of active learning, so-called learning to learn, and collaborative learning than ever before….
>
> Third, the present wave of attention to new forms of learning has much more of a basis in the psychology of learning and instruction than the previous waves. (p. vii)

Numerous constructs fall within the bounds of new learning. Although an inclusive list of these constructs is beyond the scope of this study, active learning, critical thinking, constructivism, collaborative learning, and knowledge construction compose the theoretical model of *Discussion-Related Constructs within the New Learning Paradigm* shown in this introduction and expanded upon in Chapter 2. These constructs and their relationship to this study will be explored in detail as part of the theoretical background in Chapter 2.

In 1991, Bonwell and Eison, in cooperation with the Association for the Study of Higher Education (ASHE), released the ASHE ERIC Higher Education Report Number One titled *Active learning: Creating excitement in the classroom*. In it Bonwell and Eison reported that numerous leaders within higher education and national reports have urged faculty to involve and engage students in the process of active learning, but they reported that, despite the frequent appearance in the literature, active learning did not have a precise definition. However, the authors identified general characteristics associated with strategies promoting active learning in the classroom as:

> (1) Student are involved in more than listening; (2) Less emphasis is placed on transmitting information and more on developing student' skills; (3) Students are involved in higher-order thinking (analysis, synthesis, evaluation); (4) Students are engaged in activities (e.g., reading, writing, discussion); and (5) Greater emphasis is placed on students' exploration of their own attitudes and values. (p. 2)

Bonwell and Eison (1991) offered a definition of active learning as anything that, "involves students in doing things and thinking about the things they are doing" (p. 2).

Furedy and Furedy (1985) identified critical thinking as both an attitude and a set of proficiencies. Attitude is embodied through a disposition for disciplined inquiry, based upon the willingness to question assumptions. The abilities included: recognition of when questioning is necessary, the capacity to carry out evaluations, an examination of the validity of principles, the use of logic and rationality in analysis, and adherence to the principle of disinterested scholarship. Perkins and Murphy (2006) operationalized the processes of critical thinking into a five-step model: "(1) elementary clarification; (2) in-depth clarification; (3) inference; (4) judgment; and (5) strategies" (p. 299).

Constructivism can be defined as a philosophy of learning which considers knowledge to be constructed rather than transmitted, and teaching with a constructivist methodology is "a process of helping learners to construct their own meaning from the experiences they have by providing those experiences and guiding the meaning-making process" (Jonassen, Peck, & Wilson, 1999, p. 3). The basic insight of constructivism is that learning is a creative, improvisational process (Sawyer, 2003). Popular theory (GSI-T&RC, UC, Berkeley, n.d.) breaks constructivism into two variants. Cognitive constructivism, led by educational psychologists including Jean Piaget and William Perry, concluded that knowledge comprises

active systems of intentional mental representations derived from past learning experiences (GSI-T&RC, UC, Berkeley, n.d.[a]). Social constructivism, identified with Soviet psychologist Lev Vygotsky, maintained that cognitive functions originate in, and therefore must be explained as products of, social interactions (GSI-T&RC, UC, Berkeley, n.d.[b]). Both variations of constructivism pertain to class discussion, whether conducted in-class or online.

Many times others, such as the instructor, a tutor, or fellow students, are involved in the process whereby students gain understanding. Because others assist in the process, the construct of collaborative learning applies. Strijbos (2004) defined Computer-Supported Collaborative Learning (CSCL) as "a new discipline in the educational sciences that combines the notion of group-based learning and the potential of (communication) technology to support these practices" (p. 9). Strijbos operationalized the construct with a unique reversal of the acronym, namely "learning collaboratively supported by computers". Brandon and Hollingshead (1999) stated that benefits of CSCL included increased student responsibility, greater opportunities for communication, potential for increased learning, and preparation for work in virtual teams. Gros (2001) found that CSCL promoted greater cognitive development.

Numerous authors posit knowledge construction as the end product of Computer Supported Collaborative Learning (CSCL) (Gunawardena, Lowe, & Anderson, 1997; Schellens & Valcke, 2006; Schire, 2006; Veerman, Veldhuis-Diermanse, & Kanselaar, 2001; Wang, Laffey, & Poole, 2001; Weinberger & Fischer, 2006; Zhu, 1996). Weinberger and Fischer proposed a framework which analyzed four process dimensions of knowledge construction through CSCL. The four dimensions were: (1) participation; (2) epistemic; (3) argument; and (4) the social modes of co-construction of knowledge (p. 72). Whereas

participation was primarily concerned with quantity, the epistemic dimension was concerned with the content of discussion contributions. Leitao (2000) identified three specific sequences of argument which facilitate knowledge construction; argument, counter-argument, and reply. The social mode of co-construction related to learners' references to other students' contributions to the discussion. Weinberger and Fischer recognized five specific social modes in reference to other students' contributions. The five modes were identified as: (1) externalization (failure to reference other contributions); (2) elicitation (asking questions of other students); (3) seeking common ground through negotiation; (4) shared conceptions of subject matter; and (5) conflict-oriented consensus building (p. 78–79). A goal of classroom instruction may be that the net result of students' participation in class discussion yields an increased knowledge of the subject matter which the course represents.

A graphical representation of the discussion-related constructs within Simons, van der Linden, and Duffy's (2000) *New Learning* paradigm is proposed by the researcher and follows as Figure 1. The discussion-related constructs of active learning, critical thinking, constructivism, collaborative learning, and learning outcomes build a theoretical model of *New Learning* shown in this introduction and expanded upon in Chapter 2. Note the arrows which indicate that the end product of one construct forms an input to the following construct and that learning outcomes are the sum of the process.

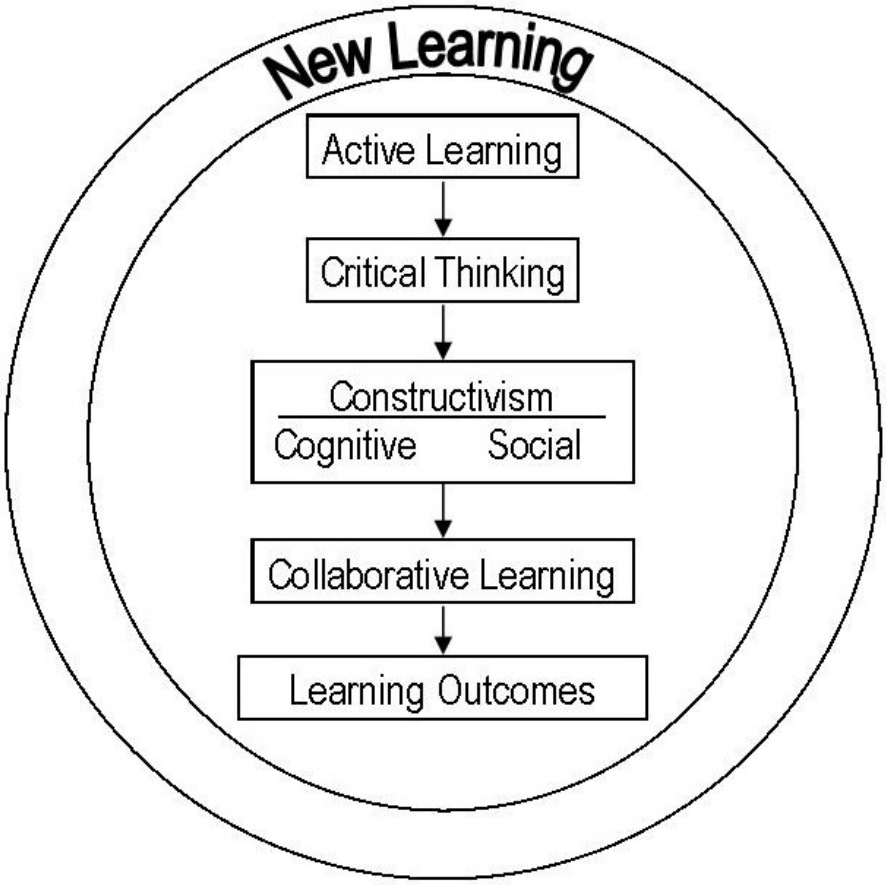

Figure 1. Discussion-related constructs within the new learning paradigm.

Classroom Discourse

Basic group teaching methods include lecture, discussion, demonstrations, field trips, role-play, resource people, and cooperative learning (Newcomb, McCracken, Warmbrod, & Whittington, 2004). In addition to whole-class discussion, Newcomb et al. identified brainstorming, buzz groups, and pair-share activities as ways to promote group discussion. In reference to whole-class discussion, Wilen (1990) distinguished between guided discussion and reflective discussion. Guided discussion is used to develop students' understanding of a topic, concept, generalization, idea, value, problem, or issue, while reflective discussion is used to encourage students to synthesize and evaluate information, opinions, and ideas.

"Despite much debate on the issue, lecturing continues to be one of the most common methods of instruction in college courses" (Marmolejo, Wilder, & Bradley, 2004, p.405). Frederick (1987) cites professors' numerous reasons why they rely on lecturing.

> "I'd like to do less lecturing, but I've got too much to cover." Or, "That's all right for you but in my field I have to lecture to get them ready for the 300 level course." Or, "I'd like to try some new ideas, but I can't – I have three hundred students in the class, you know." Or, "Student interaction is impossible in my classroom. The chairs are in rows bolted to the floor – all I can do is lecture." (p. 46)

One of the most frequent criticisms of lecture has been that the instructor typically does a majority of the talking while the students may only passively listen. In other words, "students rarely become actively involved with instruction during most lectures" (Marmolejo, et al., p.405).

At the collegiate level, leading class discussion is the second most popular teaching method following lecture (Frederick, 1994, p. 99). It is hard to know when discussion became part of the educator's toolbox of methods. When tracing discussion back to it roots, we find that discussions about teaching through discussion often begin with Socrates. Despite the portrayal of Professor Kingsfield in *The Paper Chase* (Osborn, 1971), the critical thinking approach required by the Socratic form of instruction is seldom found in classrooms at many colleges and universities.

"Empirical studies and theory suggest that educational dialogue can be used to support learners in the development of reasoning, critical thinking, and argumentation" (McAlister, Ravenscroft, & Scanlon, 2004, p.194). The fundamental value of discussion is that through them, "students develop a sense of ownership and responsibility for their own learning"

(Frederick, 1994, p.100). Fry, Medsker, and Bonner (1996) cited research which showed that the discussion method is especially effective in enabling students to: learn to think in terms of the subject matter, analyze problems, modify opinions and attitudes. Many educators who use discussion do not grade students on their participation in discussion which can lead toward an exploration of whether classroom discussion should or should not be graded. Jacobs and Chase (1992) provided persuasive reasons not to grade class participation. Record keeping could be a problem and grading involves the subjective evaluation of behavior which may be difficult to perform and hard to justify if challenged. Shy or introverted students may be disadvantaged, especially because most professors do not provide instruction on how to effectively participate in discussion. On the other hand, Bean and Peterson (1998) stated that grading class participation sent a positive signal to students about the thinking and learning an instructor valued. Bean and Peterson cited critical thinking, active learning, and the speaking and listening abilities that students need for career success as the life skills that discussion rewards.

Computer-Mediated Communication

The extension of discussion beyond the classroom walls became available with the incorporation of computers into education. Online discussion as a teaching tool was first utilized in distance education but later became incorporated into conventional face-to-face classrooms. Peters (n.d.) identified five educational advantages that online discussion tools provided to a course; (1) discussion was enhanced; (2) students were exposed to multiple opinions and perspectives; (3) shy students had more chance to voice their opinions; (4)

requiring students to write about what they think and have learned was active learning; and (5) time and location was not an issue.

"Computer-Mediated Communication (CMC) and, more specifically, computer conferencing (CC) systems have become a primary focus of educational research in recent years..." (Pena-Schaff & Nichols, 2003, p. 243). Online threaded discussion forums are a type of computer conferencing system. CMC has been one of many venues of learning fueled by the increased use of computers in education (Hiltz & Turoff, 1978).

Factors Affecting Students' Participation in Online Threaded Discussion

Numerous factors that may affect academic performance have been studied. Awareness of cognitive (learning) styles was advanced by Kolb (1976). Witkin, Oltman, Raskin, and Kasp (1971) advocated the categorization of field dependence/field independence. Myers (1987) popularized personality theories with the Myers-Briggs Type Indicator (MBTI) instrument. Studies have identified these individual characteristics as partial explanations for student performance (Sargent, Weaver, & Kiewitz, 1997; Dwyer & Cruz, 1998). Demographic designators such as race, age, gender, and nationality have also been tied to student performance (McLeod, Baron, Marti, & Yoon, 1997).

Apprehension and Anxiety

Apprehension and an underlying expression of anxiety play an important role in this study. McCroskey (1998), a leading authority on communication apprehension, draws attention to this construct.

> As researchers of the communication process, we are interested in why people differ in how they communicate. We are also very interested in why individuals differ in how they perceive and assign meaning to messages. As we enter the 21st

> century, people are increasingly more aware of the essential role that personality plays in determining a person's communication and behavior. There is growing evidence that individual traits are a major force, if not the dominant explanation, for why people communicate the way they do. (p. vii)

Although McCroskey does not single out education or CMC, the continuing rapid expansion of CMC's use in higher education warrants the need for educators outside the field of communications to become increasingly aware of the symptoms, consequences, and possible corrective measures through instructional methods, to address the importance which McCroskey has placed upon personality and individual traits.

Communication Apprehension

Research in communication apprehension has roots in the mid-1930s. One of its manifestations, *stage fright* gained notoriety based upon Clevenger's work (1958; 1959a; 1959b, as cited in Daly & McCroskey, 1984). Communication apprehension garnered attention in the academic world through the findings in McCroskey's (1970) seminal publication *Measures of Communication-Bound Anxiety*. Two specialized forms of communication apprehension are being measured and analyzed in this study, namely students' apprehension to in-class and online discussions.

Digital Divide

Students' fluency in using CMC and their access to such a system may be two factors which affect students' ability (or willingness) to participate in online threaded discussion forums. Fluency and access are, for the purpose of this study, considered to be technology factors. The concept which has become known as the *Digital Divide* includes both of these factors. Fluency and access are introduced here and covered in more depth in Chapter 2,

which also introduces additional factors that comprise the expanding notion of the *Digital Divide*.

Information Technology Fluency.

The National Academy of Science – National Research Council's Committee on Information Technology Literacy issued the report *Being Fluent with Information Technology* (NAS–NRC, 1999). The report stated,

> Generally, "computer literacy" has acquired a "skills" connotation, implying competency with a few of today's computer applications, such as word processing and e-mail. Literacy is too modest a goal in the presence of change, because it lacks the necessary "staying power"…. This requirement of a deeper understanding than is implied by the rudimentary term "computer literacy" motivated the committee to adopt the term "fluency" as a term implying a higher level of competency…. Fluency with information technology… entails a process of lifelong learning in which individuals continually apply what they know to adapt to change and to acquire more knowledge to be more effective at applying information technology to their work and personal lives. (p. 2)

Information technology fluency, or Computer-Email-Web Fluency as described by Bunz (2002, 2004) and Bunz and Sypher (2001), may play a role in students' utilization of computers, especially in their use when accessing threaded discussion forums.

Internet Access.

As previously mentioned in the section titled Computer-Mediated Communication, the ability to extend discussion beyond the classroom became available when networked computers were incorporated into education. Now that courses accessed through the Internet are becoming the standard delivery instrument for many institutions who offer distance education (Tandon & Gilman, 2003), a computer might be considered an essential tool.

With the increased use of computers, several issues of concern arise. Information technology fluency and access to networked computers may be the same type of separator between the haves and the have-nots of educational opportunity that access to books had been several centuries ago. The *Digital Divide* describes this phenomenon, and separating characteristics include economic background, race/ethnicity, gender, and age (Salter, 2001). In a university setting, where publicly accessible computers number in the hundreds, the distinguishing characteristics of *access* needs further refinement.

Demographic Equity Factors

Demographic equity factors, particularly gender, have been and continue to be actively researched in relation to discussions, both in-class and online (Altermatt, Jovanovic, & Perry, 1998; Arbaugh, 2000; Auster & MacRone, 1994; Brandy & Eisler, 1999; Davidson-Shivers, Tanner, & Muilenburg, 2000; Gefen & Straub, 1997; Hutchinson & Beadle, 1992; McLean & Rocheford, 1991; Mazzolini & Maddison, 2002; and Wade & Fauske, 2004).

Because many of these studies reported conflicting results on gender's influence, for this study, a conscious decision was made to address gender in additional analysis and not as part of the initial research design.

Jeong (2003) summarized other researchers' findings as follows:

> Significant differences in communication styles have been found between males and females. For example, men tend to assert opinions strongly as facts, place more value on presenting information using an expository style, are more likely to use crude language, violate online rules of conduct, engage in more adversarial exchanges, and terminate exchanges when there are disagreements (Fahy, 2002; Herring, 1993; Savicki et al., 1996). In contrast, females are more likely to qualify and justify their assertions, use expressions that convey more epistolary roles,

> make apologies, and, in general, manifest a more consensus-making orientation and epistolary style. Furthermore, females are more upset by violations of politeness and are more likely to challenge participants that violate rules of conduct (Smith, McLaughlin, & Osborne, 1997). (p. 394)

Statement of the Problem

This study explored higher education from the perspective of those who teach agriculture, natural sciences, or related fields, and investigated an online threaded discussion forum that supplemented in-class discussion in a traditional (face-to-face) classroom setting.

Can online discussion replace in-class discussion, potentially freeing a portion of class time for other uses? Can online discussion supplement classroom learning therefore maintaining student contact with the course for longer periods of time? From a computer-technology standpoint, the implementation of an online threaded discussion forum into a class is not a difficult task. However, utilizing a discussion forum to full potential may be.

Many hurdles may exist in the implementation of an online threaded discussion forum. Some hurdles involve characteristics of students. Three hurdles, relating to this study are (1) identifying and addressing the apprehensiveness of students, (2) verifying that students have the skill to utilize an online threaded discussion forum, and (3) insuring students have adequate access to the online threaded discussion forum.

Once the hurdles involving student characteristics are removed, then course design and online threaded discussion forum management issues can focus on the discussion forum as an *active learning* alternative which may involve students more fully in the learning process. Popular educational theory holds that involvement in the learning process will yield a higher level of cognitive learning (McKeachie, 1994).

Purpose of the Study

The purpose of this study was to determine relationships between specific factors affecting college students' participation in class discussions, both in-class and through an online threaded discussion forum. The factors studied are communication apprehension (CA), information technology fluency, and Internet access (which provides a gateway to the online threaded discussion forum). Possible gender differences are examined in an additional analysis.

Two specialized types of communication apprehension were analyzed. Neer's (1987) Class Apprehension Participation Scale (CAPS) was used as a proxy to measure students' apprehension of in-class discussion. Clarke's (1991) Computer-Mediated Communication Apprehension (CMCA) instrument was used as a proxy to measure students' apprehension of an online threaded discussion forum (which at this institution was enabled through the WebCT course management system). The students' information technology fluency was measured by the Computer-Email-Web (CEW) Fluency Scale developed by Bunz (2002). Access to the online threaded discussion forum was determined by a classification system based on students' Internet access.

Assumptions

This study is based upon the following four assumptions.

1. Students enrolled in Agronomy 450 – *Issues in Sustainable Agriculture* were representative of students within the College of Agriculture at Iowa State University.

2. The Classroom Apprehension Participation Scale (CAPS) and the Computer Mediated Communication Apprehension (CMCA) instrument were valid measures of apprehension.
3. Students accurately reported their responses in data gathering instruments and were not biased by the researcher's presence in class throughout the semester.
4. The rating of students' in-class discussion participation, determined by the instructors and researcher (aided by the students' self-reports of discussion participation), was an accurate representation of the students' actual participation in classroom discussion.

Definition of Terms

For the purposes of this study, working definitions of terms which were measured in or directly associated with the research questions are as follows. Note however, that definitions used to identify constructs not specifically measured by the research questions have either been described previously or will be described as those constructs are introduced in Chapter 2.

Classroom Communication Apprehension (CCA). Students' willingness to ask questions, respond to instructor(s)' inquiries, or join into a discussion with other students during face-to-face class sessions. For the purpose of this study, CCA will be measured by the Class Apprehension Participation Scale (Neer, 1987), which is in Appendix A.

Computer-Mediated Communication (CMC). CMC is a term "that evolved from a practical necessity to capture a large group of technologies that depend upon computer technology to facilitate communication" (Harper, 2001). Some common forms of CMC are

voice mail, audio or video conferencing, eMail, and the online threaded discussion forum upon which this study is based.

Computer-Mediated Communication Apprehension (CMCA). "CMCA may be conceptualized as an individual's fear, apprehension or anxiety associated with using or anticipation of using computers as a medium to interact with another person or persons" (Clarke, 1991, p. 5). For the purpose of this study, CMCA was measured by the CMCA Scale instrument (Clarke) which is located in Appendix A.

Discussion Teaching Method. A process of pedagogy where the instructor facilitates a structured, preplanned discussion to lead students through the process of analyzing a piece of material (McDade, 1995).

In-Class Discussion Participation (ICDP). Each student's ICDP rating was determined by the two instructors and the researcher and was based on their semester-long observations of the students. Students were ranked into five categories ranging from low to high. This observational rating of each student's participation in in-class discussion was aided by self-reports of class discussion participation which the students submitted at the end of every class period.

Information technology fluency. Information technology fluency relates to the students' skill level in using a computer to participate in the online threaded discussion forum. For the purpose of this study, information technology fluency was measured by the Computer-Email-Web (CEW) Fluency Scale (Bunz, 2002). The CEW Fluency Scale (Appendix A) measured students' aptitude in four areas, web navigation; web editing; basic computer skills; and basic eMail skills.

Internet Accessibility Index (IAI). The IAI was developed based on student responses to questions in a survey which established the level of Internet access students had at their primary residences.

Online Threaded Discussion Forum. For this study, Kirk and Orr's (2003) definition was adopted.

> A threaded discussion forum is an asynchronous (i.e., not live), web-based discussion that occurs under a number of different topics that are called "threads." A thread is one discussion topic whose name appears in the subject line in all postings associated with that thread topic. From a technical viewpoint, a threaded discussion forum utilizes an electronic bulletin board approach which assembles the different message postings and allows the end-user to view the messages either in chronological order, topical order, or both. (p. 6)

Online Threaded Discussion Participation (OTDP) Score. The students' OTDP score was determined by the researcher using a rubric that assigned points to the students' postings (their contributions) to the online threaded discussion forum.

Posting. The processing of adding a message (comment) to an online threaded discussion forum. The *post* may be a new message or a reply to a previously posted message.

Research Questions

The following four research questions were addressed in this study.

Research Question One

> *What amount of variance in students' in-class discussion participation is explained by their apprehension of class participation?*

The predictor variable for this question was the students' Class Apprehension Participation Scale (CAPS) score and the outcome variable was the students' In-Class

Discussion Participation (ICDP) rating. The expected result was that there would be a statistically significant relationship between the CAPS score and the ICDP rating. A correlation between the students' score on the CAPS instrument and the rating of in-class discussion participation they exhibited was used to determine the relationship.

Research Question Two

> *What amount of students' online threaded discussion participation is explained by the combination of computer-mediated communication apprehension, information technology fluency, and access to the online threaded discussion forum?*

The predictor variables for this question were the students' Computer-Mediated Communication Apprehension (CMCA) instrument score, the Computer-Email-Web (CEW) Fluency Scale score, and the Internet Access Indicator (IAI) value. The outcome variable was the students' Online Threaded Discussion Participation (OTDP) score. The expected result was that the CMCA score, CEW Fluency Scale score, and IAI value would be statistically significant predictors of the amount of students' online threaded discussion participation. A linear regression model was used to determine the relationship.

Research Question Three

> *Does the addition of students' apprehension of class participation to the existing predictor variables in research question two provide any additional explanation of students' online threaded discussion participation?*

The additional predictor variable Class Apprehension Participation Scale (CAPS) instrument score was added to the existing predictor variables (CMCA, CEW Fluency, and IAI) used in research question two. The outcome variable remained the students' Online Threaded Discussion Participation (OTDP) score. The expected result was that the additional

explanation, if any, of students' online threaded discussion participation due to students' apprehension about class participation would not be statistically significant. If the expected result was obtained, the CAPS score variable would be independent of the CMCA, CEW Fluency, and Internet access variables. This independence would increase the integrity of the research model by establishing that the predictor variables in research questions one and two were measuring different student characteristics. To determine the relationship the CAPS score was added as an additional step to the linear regression model used in research question two.

Research Question Four

> *What relationship exists between students' online threaded discussion participation and their in-class discussion participation?*

Students' Online Threaded Discussion Participation (OTDP) score and students' In-Class Discussion Participation (ICDP) rating were correlated. The expected result was that there would not be a statistically significant relationship between the two types of student discussion participation. If no relationship were found, the two measures of student discussion participation would be independent. This independence would increase the integrity of the research model by establishing that the two outcome variables in the research model were measuring different student outcomes.

Research Model

Figure 2, which follows, is a visual summary of the relationships among the four research questions in the overall research design. The boxes on the left-hand side represent the predictor variables, while the boxes on the right-hand side represent the outcome variables.

The research questions are shown as non-bold boxes between the predictor and outcome variables. The lines represent the relationships between the predictor variables and the outcome variables that were determined by statistical correlation or regression processes.

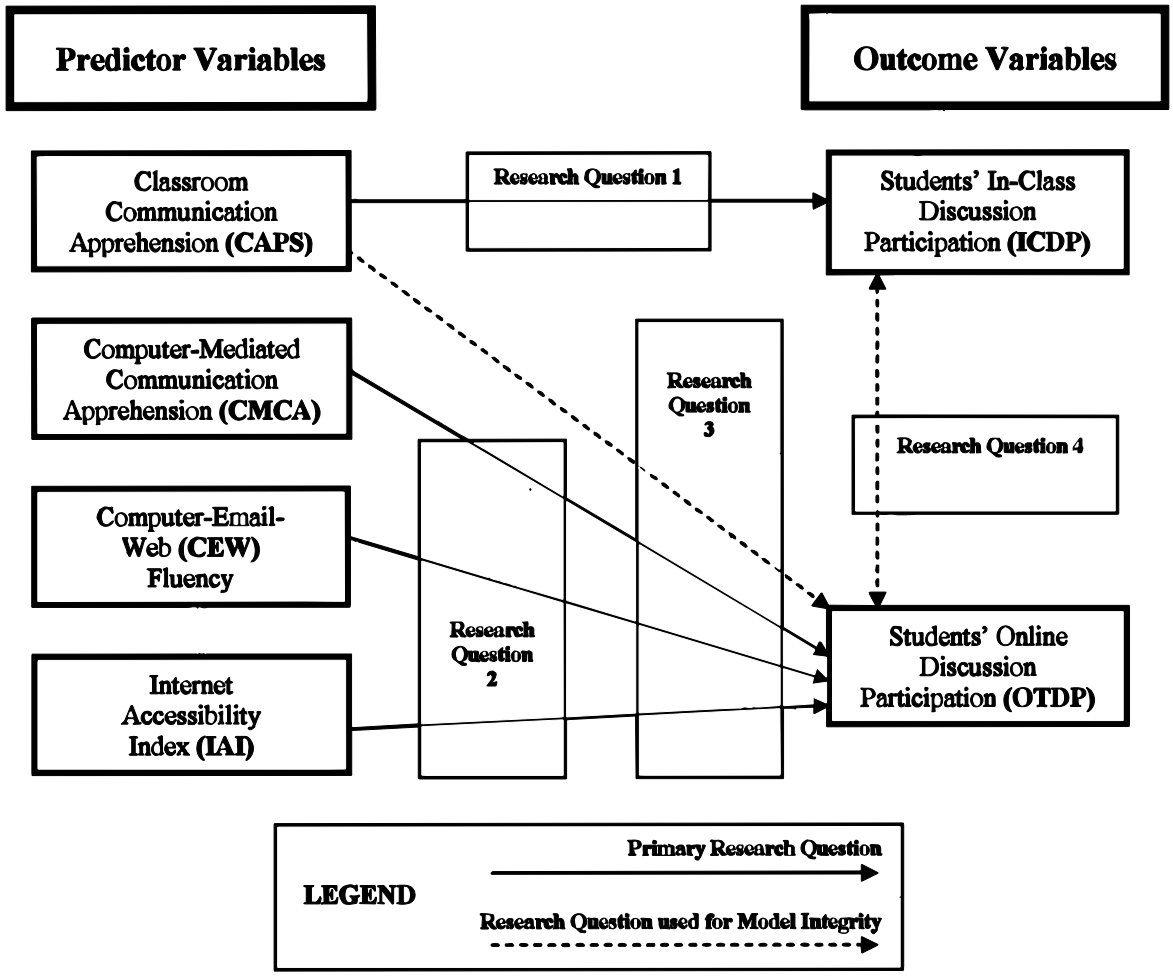

Figure 2. Research model for factors affecting college students' discussion participation.

Significance of the Study

Instructors face many instructional design decisions, including the use of technology-supported activities, when they develop and modify their courses. Instructors will be able to make more informed choices based on research that investigates the factors affecting college students' participation in discussion, whether in-class or through an online threaded discussion forum.

This study will increase the existing body of knowledge in three ways. First, it will provide an analysis of factors using a comprehensive set of instrumentation. In this study, apprehension of classroom participation and apprehension of computer-mediated communication will be determined with specific measures whereas previous studies commonly used McCroskey's (1981) PRCA-24 instrument. Although the PRCA-24 instrument measures four communication apprehension dimensions, none are specific to computer-mediated communication or classroom settings. Second, this study will use validated measures of information technology fluency derived from the two principal applications required for CMC, namely eMail and a World-Wide-Web browser. Finally, this study will provide additional data regarding factors affecting students' participation in class discussion.

CHAPTER II
LITERATURE REVIEW

This chapter describes the theoretical background for the study that was depicted in Figure 1, *Discussion-related constructs within the new learning paradigm*, which was presented in Chapter 1. The theoretical background begins with a discussion of new learning and examines how the constructs contained within it are embodied by students' participation in discussion. Next, discussion as a teaching method is addressed. In it, research relating to learning through students' participation in face-to-face classroom discussion is presented along with research relating to the measurement, scoring, and evaluation of students' discussion in the face-to-face environment. Third is a review of computer-mediated communication (CMC) research in general followed by a review of research about online threaded discussion forums. Again, research relating to learning through students' participation in discussion along with measuring, scoring, and evaluating students' discussion are addressed but from an online threaded discussion forum perspective. Finally, factors that may possibly affect students' participation in discussion are analyzed. Both factors that were measured in this study or those thought to have an effect are covered.

New Learning

Simons, van der Linden, and Duffy (2000) referred to new learning from three perspectives: "kinds of new learning outcomes needed, the learning processes that will lead to these outcomes, and the kind of instructional processes that can bring about these learning processes" (p. 1). All three perspectives are relevant to this study. Learning outcomes can be examined from two viewpoints. One viewpoint is the transferability of learning outcomes

which contain products that are durable, flexible, functional, meaningful, generalizable, and application oriented. The other viewpoint looks at learning outcomes from the end products of thinking and collaborating. This second viewpoint, the new learning outcomes of thinking and collaborating, will frame the constructs of new learning that follow.

Active Participation and Active Learning

Educational research has shown that more effective learning takes place if learners are actively involved instead of being passive listeners (Webb, Jones, Barker, and van Schaik 2004). Bloom (1976) argued that when students take a more active role in the learning process, more productive learning occurs.

> In general, about 20% of the variation in achievement of individuals is accounted for by their participation in classroom learning. The amount of active participation in learning is an excellent index of the quality of instruction for the purpose of predicting or accounting for individual student learning. (p. 123)

Frederick (1987) cited the major recommendation of a 1984 National Institute of Education report, that student involvement be increased by making greater use of active teaching modes. Active learning is achieved through discussion because it allows students to reflect, evaluate, and self-analyze, increases student motivation, and helps students share resources while problem solving (Chickering & Erhmann, 1996).

Van Hout-Wolters, Simons, and Volet (2000) divided active learning into two types, self-directed learning and independent work. Student participation in class discussion, both in face-to-face classrooms and in online threaded discussion forums, can be defined as self-directed learning. In a review of literature, Oddi (1983) suggested that self-directed learning

is generally more effective than traditional lecture-based instruction with regard to both college student achievement and attitude toward the learning process itself.

Vokel (1995) found that a reduction in active student involvement in learning is linked to decreased course performance. Karp and Yoels (1976) stated that discussion participation is an indicator of whether students are keeping up on reading assignments. Collaboration in discussion is an important element in active learning (Bryant, 2005). Miller and Corley (2001) suggest that "it is a fundamental conclusion that in both traditional and online courses the learner must be an active participant in order to be successful" (¶3).

Critical Thinking

Furedy and Furedy (1985) discussed the lack of and the need for research on critical thinking. They stated that researchers did not even agree on a precise meaning for the term. Their definition was "critical thinking consists both of an attitude toward inquiry and a set of proficiencies necessary for the effective expression of that attitude in scholarship and discussion" (p. 51). In the two decades that have followed, more research has taken place. We are now seeing benefits from this research into student outcomes, some of which may be attributed to discussion. Students are better at critical thinking, an outcome of making connections and extending the content beyond the classroom after using discussion forums (Williams et al. 2001). The overall benefit of discussion, as perceived by professors, was that discussion "gave students opportunities to think at deeper levels, thus developing critical thinking on specific topics" (Bailey & Wright, 2000, p. 6). Greenlaw and DeLoach (2003) further suggest that "Electronic discussion appears to provide a natural framework for

teaching critical thinking" (p. 36). Taken together, research—whether student participation is assessed from a lecture-oriented or discussion-based standpoint—seems to suggest that critical thinking is nurtured by both in class and electronic discussion. The following illustration, Figure 3–*Critical thinking constructs for discussion board moderators*, proposed by Hofmeister and Thomas (2005), shows the relationship between threaded discussion forums and critical thinking. Note in the illustration: VLM refers to Virtual Learning Module.

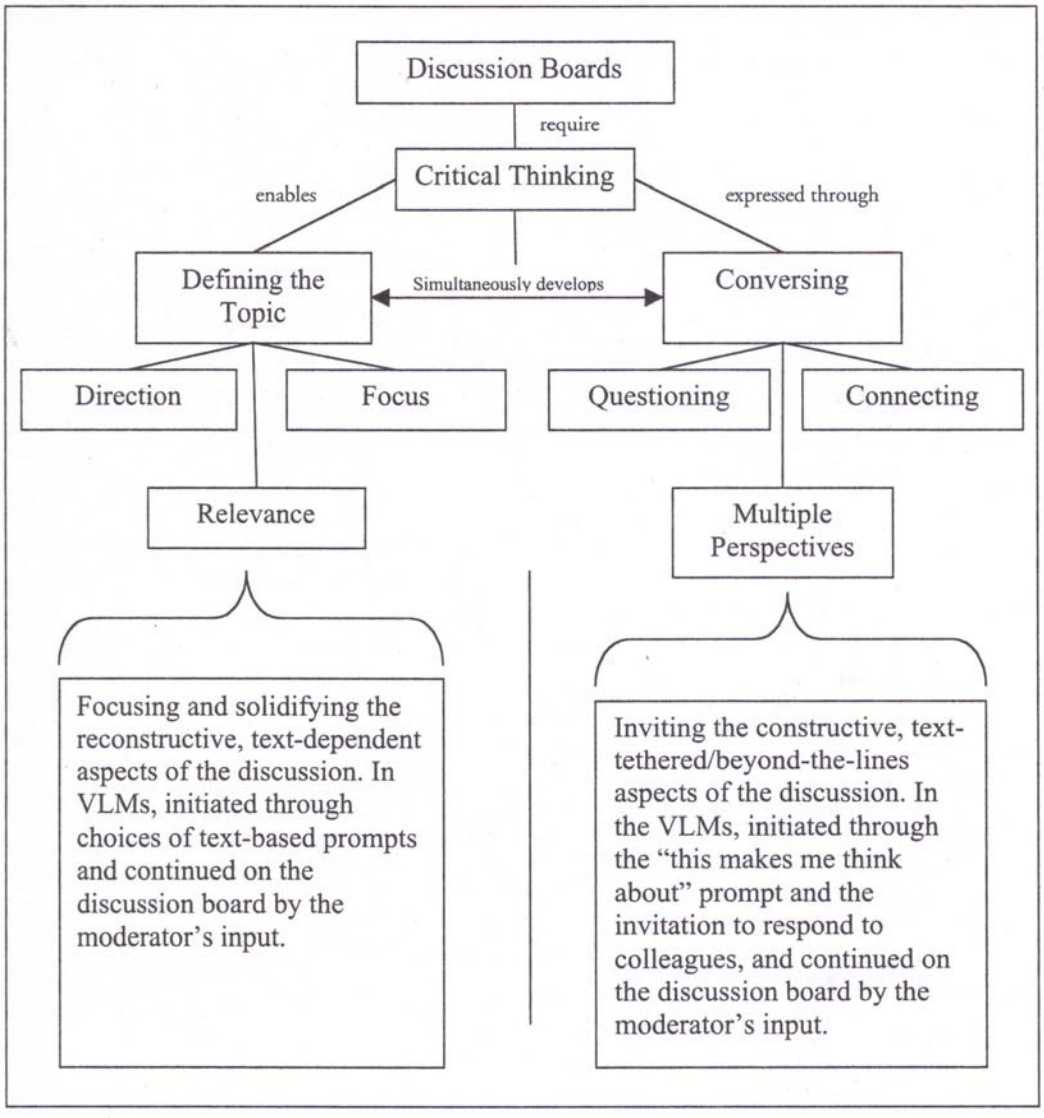

Figure 3. *Critical thinking constructs for discussion board moderators* (Hofmeister & Thomas, 2005).

Constructivism

Constructivism is at the nexus of philosophy, psychology, and pedagogy because it integrates learner autonomy and a holistic perspective (Doolittle & Camp, 2003). Meaningful discourse was a main goals of constructivist learning because it supported knowledge construction through articulation, reflection, and social negotiation (Jonassen, Davidson, Collins, Campbell & Bannaan-Haag, 1995). "In a constructivist view, learning is an active process in which the learner is building on an ongoing basis an internal representation of knowledge, a personal interpretation of experiences" (Jiang & Ting, 1998, p. 1). They continued "thus an important element in instruction is to provide an environment for students to interact and collaboratively construct meaning" (Jiang & Ting, p. 2).

Chou, (2001) made the distinction between the two variations of constructivism:

> Constructivism theorists who draw from Piaget put more emphasis on individual constructions of knowledge as a result of interaction with the physical environments. Constructivist theorists who are influenced by Vygotsky posit that knowledge is constructed through the appropriation of culturally relevant activities. In other words, knowledge is co-constructed with peers or experts and through the immersion in a social context. (p. 175)

Lazonder, Wilhelm, and Ootes (2003) categorized constructivists within the realm of Computer Supported Collaborative Learning (CSCL). Cognitive constructivists believed that the input in the Computer Supported Collaborative Learning (CSCL) environment fostered learning due to the explication of individual knowledge elements (retrieval from memory) and the constructive reorganization of knowledge in the course of social transaction. Social constructivists believed that CSCL promoteed the collaborative process in which meaning was negotiated and knowledge was co-constructed.

Ferdig and Roehler (2003) cited Vygotsky (1978) who theorized that word meaning–or more broadly, the dynamics of meaning making–develops through the social process of language over time. Computer-mediated communication has been identified as being "social constructivist" (Arbaugh & Benbunan-Fich, 2004; Merron, 1998). Continuing the social constructivist premise, discussion allows teachers to move to more of a facilitating role, enabling peer interaction (Bober & Dennen, 2001).

Cooperative and/or Collaborative Learning

Numerous references to cooperative and collaborative learning are found in the literature. Are these term synonymous? Kreijns, Kirschner, and Jochems (2003) stated there is considerable disagreement on the terms. There are, however, numerous similarities. Kirschner (2001) cited Matthews, Cooper, Davidson, and Hawkes (1995), noting that in both:

> learning is active;
> the teacher is usually more of a facilitator than a "sage on the stage";
> teaching and learning are shared experiences;
> students participate in small-group activities;
> students must take responsibility for learning;
> students are stimulated to reflect on their own assumptions and thought processes; and, social and team skills are developed through the give-and-take of consensus building. (p. 4–5)

Johnson and Johnson (1986) viewed the evidence to be persuasive when comparing cooperative teams versus individuals regarding higher levels of thought and retention of information. Vygotsky (1978) indicated that students are capable of performing at higher intellectual levels when asked to work in collaborative situations than when asked to work individually. "Group diversity in terms of knowledge and experience contributes positively to

the learning process" (Gokhale, 1995, ¶2 following heading *Discussion of the Findings*). Gokhale concluded that "collaborative learning fosters the development of critical thinking through discussion, clarification of ideas, and evaluation of others' ideas" (¶1 following heading *Implications for Instruction*).

Computer Supported Collaborative Learning (CSCL)

Ferdig and Roehler (2003) stated that discussion forums have the potential to increase interactivity. Through this interactivity, students rely on each other for support and guidance and an enhanced sense of teamwork and collaboration. Ferdig and Roehler concluded that the interactivity can lead to a deepening understanding of content. Jiang and Ting (1998) stated:

> The various perspectives that emerge during online discussion clarify and illuminate learning for all members in the class. Thus, theoretically, an online environment is claimed to support this process of construction of meaning and sharing of multiple perspectives through online discussion. (p. 2)

Studies indicated that social interaction and collaborative learning which are supported by instructional technology can lead to deeper understanding and creation of new knowledge among students (Bransford, Brown, & Cocking, 1999; Koschmann, 1996).

Learning Outcomes

"Knowledge construction occurs when students explore issues, take positions, discuss those positions in an argumentative format and reflect on and re-evaluate their positions (Jonassen, Davidson, Collins, Campbell & Bannaan-Haag, 1995, p.16)." This can happen in face-to-face discussion and in online threaded discussion forums. Schellens and Valcke

(2005) identified the use of online threaded discussion forums to "foster discourse and active individual knowledge construction" (p. 958).

Through class discussion, including online threaded discussion forums, instructional methodology is shifting from communication of fixed content and skills to an environment in which students are led to experience the knowledge construction process (Knuth & Cunningham, 1993). "From this perspective, students construct interpretations, appreciate multiple perspectives, develop and defend their own positions while recognizing others, and become aware of and be able to manipulate the knowledge construction process itself " (Bonk & Reynolds, 1997).

Knowledge construction is viewed by some researchers (Veerman, Veldhuis-Diermanse, & Kanselaar, 2001; Gunawardena, Lowe, & Anderson,1997) as the final step or stage in a series of communication processes. Zhu (1996) proposed the following model, Figure 4, *Pattern of knowledge construction in the electronic discussion* (p. 839). The four products are: new perspective, new understanding, new insights, and new knowledge. All four of these relate to knowledge construction and seem appropriate products of new learning. Note in the illustration that PK referred to prior knowledge. Also, VAXnotes referred to the computer software system which enabled the electronic discussion depicted in Figure 4.

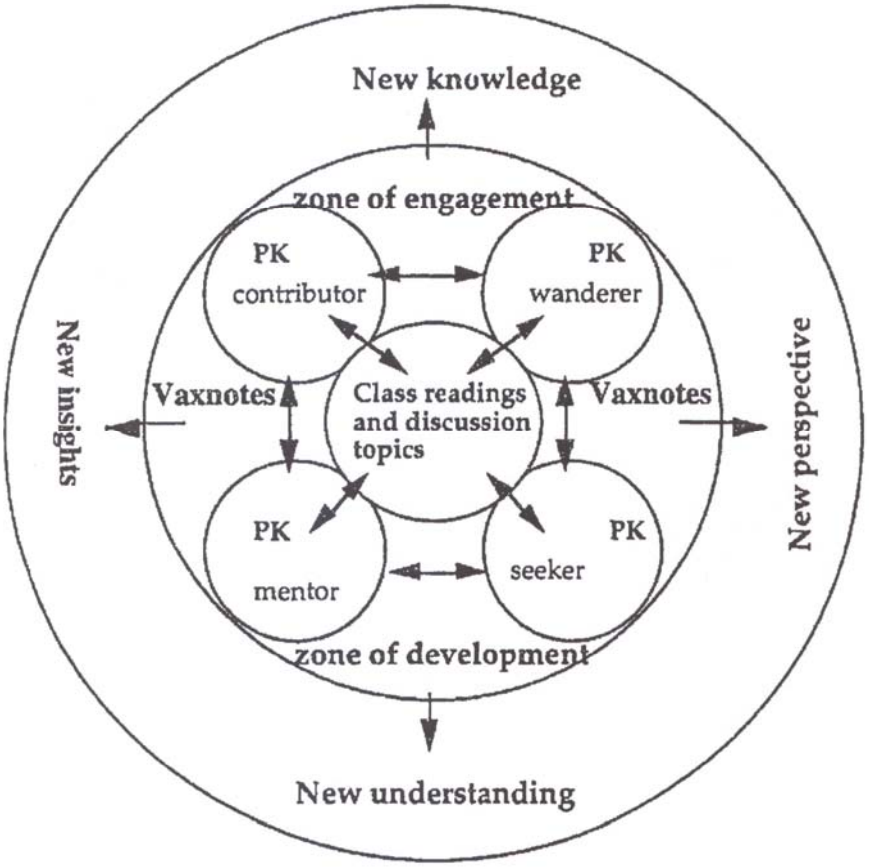

Figure 4. Pattern of knowledge construction in the electronic discussion (Zhu, 1996).

Discussion Teaching Method

The discussion teaching method section of this literature review is organized as follows. The discussion teaching method is described and educational benefits are cited, then illustrations of different classrooms and types of dialogue are provided along with several models identifying teacher questioning techniques. Next, advantages and challenges in implementing the discussion teaching method are analyzed. Research which provides a foundation for the theory of increased student performance through discussion follows. Methods of measuring, scoring, & evaluating face-to-face discussion conclude the section.

Elmore (1991) described the discussion teaching method as a "systematic way of constructing a context for learning from the knowledge and experience of students, rather than exclusively from the cannons of knowledge" (p. xiv). Dialogue is arguably one of the most important parts of any learning process and many models that explain learning processes emphasize its importance (Webb, Jones, Barker, and van Schaik 2004). McKeachie (1994) concluded the evidence in favor of student discussion is strong enough that whenever possible instructors should provide the opportunity for such finvolvement. There are some obvious overlaps between the discussion teaching method itself versus discussion within other teaching methods such as lecture and small group discussion. The support for discussion presented here borrows from various teaching methods and these methods are not meant to be mutually exclusive.

The discussion teaching method lends itself to many scenarios. Gall and Gillett (1980) identified subject matter mastery, issue-oriented discussion, and problem solving as likely candidates. McMillion (1997) cited Daughtry (1973) who concluded that discussion has the following advantages:

> The capability to adapt well to most subject matters; the capacity to motivate students through participation, feedback, and reinforcement; the ability to develop critical thinking skills; and the ability to provide an environment that encourages a more relaxed, extended rapport between teacher and students. (p. 4–5)

Numerous educational benefits have previously been cited promoting the use of the discussion teaching method in the section describing new learning. Wade (1994) stated that although journal writing can be a useful tool for reflection, discussion is distinctly suited to two key components of reflection: viewing a situation from multiple perspectives and seeing

alternatives to one's thinking". Larson and Parker (1996) added that discussion is the centerpiece of democratic education, a sentiment echoed by Brookfield and Preskill (1999).

From a methodology standpoint, discussion allows the instructor an indication of student understanding of the material. Fong (1987) provided an example:

> To not use class discussion is to cut off a source of continuous information of student progress. Like a pilot refusing to use radar in a fog, the discussionless class flies blind, relying only on occasional glimpses through exams and papers to determine whether his students are on course or not. (p. 30)

This is becoming more of a challenge in light of declining student preparation. Whiteman (2002) states that "hopefully, students have read the material and come to class ready to discuss it. In undergraduate classes that rarely happens and in graduate classes, perhaps half of the students have seriously considered the readings" (p. 4).

What differentiates the discussion teaching method from classroom dialogue? Bridges (1979) identified three characteristics of discussion. First, discussants put forward more than one point of view on a subject. Second, discussants are disposed to examine and be responsive to different points of view put forward. Finally, discussants have the intention of developing their knowledge and understanding and/or judging the matter discussed. Bridges added that true discussion is characterized by openness, freedom, equality, respect, and truth.

Categorizations can be made based on classroom climate or the structure of the discussion itself. Alpert (1987) described three types of classrooms "in which instructional discussions were considerably different from each other in student's participation and involvement"(p. 33). The active classroom involves many students who perceive it as interesting and instructive. In other classrooms, conformity and expectation of student roles, not genuine expression of interests directs classroom climate. These classrooms are

controlled by the teacher. Silence dominates the remaining classrooms where whole-class discussion was intended but was instead thwarted by students' lack of interest and passive resistance.

Mercer, Wegerif and Dawes (1999) identified three types of classroom dialogue. In cumulative dialogue there was much overt agreement between participants but little engagement of ideas. Disputational dialogue contained non-constructive argument. Again, engagement of ideas was limited. Preferred dialogue contained exploratory talk where knowledge was made publicly accountable and reasoning was visible in the talk. Burnett (1993), dealing with dialogue in written form, noted similar types and found that constructive conflict developed mature writing whereas simple agreement or disagreement did not.

Roby (1988), and Larson and Parker (1996) each have five-level models identifying teacher questioning techniques in classroom discussion. Roby's model starts with what he describes as a quiz show which contains recitation style questions. Next is the problematical discussion where the instructor uses questions that address a puzzling problem. Informational discussion, the first closely identified with the discussion teaching method, uses questions, whether from teachers or students, to verify statements made in the preceding dialogue. Fourth, the dialectical discussion uses questions that encourage the exchange of multiple opinions and perspectives. Finally, in what Roby describes as "the bull session," student-determined questions with no educational value predominate. It should be noted that although the bull sessions may not have a distinct end, they may be of some educational value if they contain a distinct beginning.

The Larson and Parker (1996) model shares several steps that are similar to Roby's (1988). Step one is discussion as recitation style questions, followed by step two, discussion

as teacher-directed conversation. Next is discussion as open-ended conversation. Fourth is discussion as posing challenging questions. Larson and Parker's final step is discussion as application. In both the Roby and Larson and Parker models, the term recitation is used. Recitation is a three-step interaction process known as IRE: initiation, response, and evaluation. IRE is typified by initiation of a statement or question by the instructor, response by the student, then evaluation or feedback by the instructor. Gall and Gillett (1980) differentiated between IRE and other types of dialogue in that recitation tended to focus on student's recall and reciting of subject matter content compared to discussion which tended to focus on higher cognitive objectives. Larson and Parker echoed similar sentiments in their statement "Discussion, on the other hand, is educative and group conversation between teacher and students about subject matter is at the higher cognitive levels" (p. 113).

Apprehensions of utilizing the discussion teaching method exist from both an instructor and a student standpoint. Student reticence, loss of control, and a belief that learning outcomes are not served effectively with discussion were potential instructor concerns identified by Gall and Gillett (1980). Some instructors were cautious with the discussion teaching method due to students' comfort level. Classrooms can appear noisy and unorganized when students are first introduced to the discussion teaching method. This usually lessens when students become accustomed to the new environment. Although there may be some loss of control, this is a tradeoff with the shared responsibility for learning that exists with discussion. Since discussion can be effective in numerous scenarios and content areas, concerns pertaining to learning outcomes may be unfounded.

From a student standpoint there are also challenges when participating in the discussion teaching method. Some of these will be examined in the section titled "Factors" later in this

chapter. Wade (1994) highlighted the following issues. Some students think their opinions will be judged unworthy and are afraid of criticism, and some students have had negative discussion experiences, although others report positive experiences. Increasing participation by less active students and balancing talk time between students requires instructor skill. Three student beliefs about discussion were part of the results Wade reported. The belief that participating in class discussion is a matter of personal choice was held by 66 percent of the students although 56 percent report that one has the responsibility to contribute at least occasionally. An overwhelming 90 percent supported the belief that being able to speak up in a group of one's peers is important. Age, gender, ethnicity and culture may impact students' participation in discussion. As mentioned before, these will be examined in more detail later.

In summary, discussion may be stifled if students are uncomfortable speaking freely or do not perceive that their ideas will be respected and accepted by others. Other factors influencing conceptions and uses of discussion, which are more difficult to determine quantitatively in terms of student demographics, include: maturity of students, classroom personality, and lesson objective.

How else do the students feel? Beishline (1997) found that students greatly preferred learning incorporating voluntary participation over lecture only. Interestingly, lecture with required participation was disliked nearly as much as lecture only.

Not all research indicates discussion as a way to openly exchange ideas or build new knowledge and viewpoints. Trosset (1998), in a study at Grinnell College, found that 15 percent of students participated in discussion to advocate views they already held and thought "they had the right think or say whatever they liked without being challenged"

(p. 48). One should ask; however, whether the percentage holding this attitude at a large public university be similar to the percentage at a small liberal arts college in rural Iowa.

"The commonly held belief that the discussion method belongs to English and the social sciences is unfounded" (Gall & Gillett, 1980, p102). They continued "discussion has a place in every subject area" and summarized with the following:

> Discussion is a method of great versatility in classroom teaching. Research findings demonstrate its effectiveness. Unfortunately, its potential has not been realized because teachers and students do not receive proper training and encouragement in the use of discussion skills. The task facing teacher educators is to develop and implement programs that provide this training. (p. 102)

Learning Through Participation in Face-to-Face Discussion

An information systems scholar (G. Covert, personal communication, July 15, 1998) stated that the phrase "it is widely known that …" implies that the evidence is so overwhelming that justifying with proof is not required. Numerous researchers have noted the effectiveness of discussion without the need for citation; however cited references have been obtained for this study.

Perhaps one reason for the lack of citations referring to discussion's effectiveness is the age of those possible citations. Nunn (1996) stated:

> Furthermore, observational studies of classroom interaction at the college level are infrequent, the few existing studies are dated (for example, Fischer & Grant, 1983; Karp & Yoels, 1976; Smith, 1983), and most studies were conducted in small private liberal arts colleges" (p. 243).

Bligh (2000) concurred with the dated nature of discussion effectiveness research and both Bligh and, Bonwell and Eison (1991) report comprehensive summaries of research.

Research relating to the effectiveness of discussion covers a sweeping area and two popular distinctions are usually made, the educational grade level of students being studied and the type of information being taught. The research reported here will focus, whenever possible, on the effectiveness of discussion with post-secondary students.

Bligh (2000) breaks the review of research in discussion effectiveness compared to other methods into four separate criterions with the first three (acquisition of information, development of thinking skills, and changes in attitudes, interest, and popularity) being important to the research reported here. The comparison of discussion with presentation type methods was broken into two sub-groups. Tutored groups were defined as discussion where the teacher participated and tutorless groups were defined as ones where the teacher was not a member. A summary of the research Bligh reported follows in Table 1.

Table 1. *Effectiveness of discussion compared to other methods.*

Criterion	Sub-Group	Number	Discussion More Effective	No Significant Difference	Other Methods More Effective
Acquisition of Information	Tutored	86	21 (24%)	47 (55%)	18 (21%)
Acquisition of Information	Tutorless	37	15 (40%)	16 (43%)	6 (16%)
Development of Thinking Skills	None	42	37 (88%)	2 (4.7%)	3 (7.1%)
Change in Attitudes	None	35	20 (57%)	11 (31%)	4 (11%)
Interest in the Subject	None	12	7 (58%)	4 (33%)	1 (8.3%)
Popularity (see note which follows this table)	None	22	20 (90%)	1 (4.5%)	1 (4.5%)
	Total	**234**			

Note in Table 1 that popularity dealt with student's enjoyment of the teaching method. Bligh observed that popularity can be an indicator of high persistence and/or low dropout rate.

In light of the information Bligh presented (summarized in Table 1), discussion far exceeds other teaching methods when considering the following: the development of thinking skills, changes in students' attitudes and interest, and the popularity of the teaching method. Even in comparisons where acquisition of information (the least persuasive indicator) was the criterion, approximately half the studies reported *No Significant Difference*.

If the goals of education are to enhance critical thinking and problem-solving skills and facilitate retention for later application, Bonwell and Eison (1991) also recommended using discussion because the exchange of ideas in a discussion format was a more effective way of influencing student thinking than a traditional lecture format. "Discussion of content as a part of class helps students clarify ideas and promotes long-term retention of information" (Harden, 2003, p. 26). Hudson and Bruckman (2004) suggest that, "unlike engagement, which only requires active mental attention, participation requires that listeners also contribute to the discussion" (p. 126). They went on to state "sociocognitve approaches to learning emphasize the importance of participation in activity as part of the learning process" (p. 126).

Larson and Keiper (2002) held that:

> Discussion is thought to be a useful teaching technique for developing higher order thinking skills; skills that enable students to interpret, analyze, and manipulate information. Students explain their ideas and thoughts, rather than merely recount, or recite, memorized facts and details. During discussion learners

> are not passive recipients of information that is transmitted from a teacher. Rather, learners are active participants. Discussion, when combined with probing, open-ended questions, requires students to organize available information for the purpose of arriving at their own defensible answers. (p. 2)

Measuring, Scoring, & Evaluating Face-to-Face Discussion

In a study of syllabi in core curriculum classes at Seattle University, Bean and Peterson (1998) found that 93 percent of courses included class participation as part of course grades. Informal follow-up revealed that many professors simply used participation as a fudge-factor when computing final course grades. Perhaps a more formal assessment of participation would provide learning benefits to the students and allow professors a more defensible position should the need arise to explain a disputed grade. Armstrong (1978) traced assessment of group discussion to World War II, when German military psychologists believed participation in group discussion was an indicator of leadership potential.

A strong case has been made in the aforementioned research that student participation in class discussion is a component of active learning. All scholars do not agree, so brief mention will be made of the theory that students can actively process information and therefore construct knowledge as an observer of, not a participant in, class discussion. Fong (1987) described silent students whose learning by listening involved attention and anticipation, imagining possible points the speaker may address next, and the capability to envision a future direction of the presentation. These students are clearly learning. Scriven (1974) described students, who on an end of semester summary stated, “I learn by listening to others and comparing their ideas to mine” (p. 155). Townsend (1998) described silent students, who by listening to others’ conversations, have planted seeds for later, private, cultivation.

Scriven stated that teachers placed far too much emphasis on verbal participation in an effort to involve students in class. Although silent students may indeed be learning, other students, in the vein of collaborative learning, think that silent students are cheating them (those who *do* participate) by not sharing information.

If it is determined that class discussion should be evaluated, the criterion for and mechanics of evaluation need to be addressed. The literature contained a variety of instruments used by educators to quantify and qualify student contributions in classroom discussion. The eleven instruments reviewed contained many different features and facets; however, close examination revealed numerous similarities.

Selection or development of an instrument to measure student participation in classroom discussion involved determining or acknowledging whether participation is voluntary or mandatory. The aforementioned issue of silent students has provided one perspective on the issue. Another perspective was stated by Marzano, et al. (1988); "Moreover, research reveals that students with a high grade orientation value only those portions of a course that are visibly graded" (p. 137). It would follow that those students might be enticed to participate if participation were more formally evaluated. If course objectives address the general skills of oral communication and group work, assessment of class participation can provide some basic criteria by which those skills can be evaluated regardless of the subject matter of the course.

Whether due to time constraints, years of refinement, or simple convenience, some of the instruments described have scales in which the students had no involvement in constructing. In other instruments, construction of the scale was a major activity that may have consumed one or more class periods. Searby and Ewers (1997) stated that the commonly held view in

the literature was that students should have input into the criteria on assessment. Student involvement in instrument creation is a learning experience for the students because they are required to address what behaviors constitute performance (Bushart, Fower, & Debnath, 1985). Even if students are not involved in scale construction, explanation can increase the students' buy-in of the usefulness of the scale. Another technique to increase student buy-in involved having the students do a preliminary self-examination to understand how the instrument worked (Dancer & Kamvounias, 2005; Fischer, 1975).

Numerous differences existed in who performed the assessment, when the assessment was completed and when (or if) the students received feedback. Criterion used in the instruments varied from simple frequency counts to complex rubrics which contained up to eight factors that allowed a student to score between one and five in each of the areas for a total of up to 40 points. Similarities and differences in the 11 methods of evaluating student participation in the classroom along with a table including features of the evaluation instruments are summarized in Appendix D.

Computer-Mediated Communication (CMC)

The computer-mediated communication section of this literature review is organized as follows. Computer-mediated communication is defined and examples of synchronous and asynchronous implementations of CMC are given. Next, online threaded discussion forums are introduced. Interaction types follow and the model for Online Interaction Learning Theory is presented. Two comparisons of group research supporting the use of online

threaded discussion forums are analyzed. The section concludes with the research in and application of, measuring, scoring, and evaluating online threaded discussion forums.

Chesebro and Bonsall (1989) defined computer-mediated communication as any form of interaction between a human and computer. Clarke (1991) described computer-mediated communication systems as a combination of computer software and hardware which allowed individuals to structure, store, send, receive, and process communications. Clarke made the distinction between communication through computers, as opposed to communication with computers. Strate, Jacobson, and Gibson (1996) clarified that there are "both humans programming computers and computers programming humans" (p. 7). Computers programming humans played a role in education when behaviorism was a predominant theory. The teaching machine and programmed instruction became a primary research emphasis during the 1960s (Burton, Moore, & Magliaro, 2005). Romiszowski and Mason (2004) asserted that communication, including social aspects, formed the basis of the more recent definitions rather than the hardware or software. They cited Jones (1995) who stated "CMC, of course, is not just a tool; it is at once technology, medium, and engine of social relations. It not only structures social relations, it is the space within which the relations occur and the tool that individuals use to enter that space" (p. 398).

Computer-mediated communication can be divided into two primary types, synchronous and asynchronous. Romiszowski and Mason (2004) distinguished synchronous as real-time communication and asynchronous as delayed-time communication. The synchronous implementation of computer-mediated communication was often called chat, "presumably after Internet Relay Chat, a commonly available network of synchronous CMC resources and topic areas" (Winiecki, 2003, p.199). In educational settings, "chat rooms" usually contain

the instructor (or other facilitator) and a group of students. Communication between participants in a chat room usually occurs as a one-to-one or one-to-many interaction.

Asynchronous implementations of CMC in an educational support role began with eMail. Listservs (eMail messages broadcast to all members of a distribution list) and electronic bulletin boards followed with advancements in technology. Now, specific course management systems (CMS) such as Blackboard (and its WebCT acquisition), Angel, eCollege, Desire2Learn, Sakai, and Moodle are being utilized on college campuses to facilitate synchronous and asynchronous online discussion.

Some developers of online learning claimed that asynchronous communication was the preferred mode over synchronous (Davidson-Shivers, Mulinburg, and Tanner, 2001). Bober and Dennen (2001) stated an additional distinguishing factor of asynchronous communication is that it allows students to follow multiple threads (conversations) at once. Other advantages of asynchronous communications over synchronous were that students had more opportunities to interact with each other (instead of just the instructor) and students had more time to reflect, think, and search for extra information before contributing to the discussion (de Weaver, Schellens, and Valche, 2004, as cited in de Weaver, Schellens, Valche, and van Keer, 2006; Pena-Shaff & Nichols, 2004). Driscoll (1998) stated that asynchronous communication was a benefit because it allowed students more time for reflection. Romiszowski and Mason (2004) found little research indicating that synchronous communications were conducive to in-depth reflective discussion of the type required to develop critical and creative thinking skills. Pena-Shaff, Martin, and Gay (2001) concurred with the lack of reflective thought in synchronous chats, but stated that synchronous chats

may be a good forum for specific tasks such as idea generation, and offered that synchronous chats have the advantage of immediate feedback.

Under the umbrella of computer-mediated communication are subsets with unique characteristics. Two popular variations, Computer-Supported Collaborative Learning (CSCL) and Asynchronous Learning Networks (ALN), will be mentioned briefly. However online threaded discussion forums, a feature they share in common, is the focus of the research reported in this study.

Computer-Supported Collaborative Learning (CSCL) is the use of computer and Internet technologies to support an instructional method where students work in groups to accomplish a learning task (Changwatchia, 2005). Some of the benefits of CSCL included increased student responsibility, more opportunities for communication, a potential for greater learning, and group work through virtual teams. Along with those benefits were hurdles to overcome which included reconciling technological, pedagogical, and learning issues, plus being able to create online learning activities involving CSCL (Brandon & Hollingshead, 1999). Studies have shown that CSCL could increase student motivation which led to more participation that, in turn, enhanced active learning. This active (and interactive) learning should lead to critical thinking and knowledge construction (Harasim, 1991). Roberts (2005) identified additional social and psychological benefits of CSCL including developing a support system, building diversity, establishing a positive atmosphere, and increasing self-esteem.

The term Asynchronous Learning Networks (ALNs) originated at a 1994 meeting of Sloan Consortium grantees (Mayadas, 1997 as cited in Hiltz & Goldman, 2005). As the name implies, a key feature is that ALNs are asynchronous and each person's ability to work at their own pace and preferred times is cited as the most important feature (Hiltz & Goldman,

2005). This anytime-anywhere feature distinguishes ALNs from computer-supported collaborative learning which can include synchronous communication. Hiltz and Goldman noted that the second characteristic of an ALN is that "it involves students learning together in a cooperative or collaborative manner that ideally leads to the development of a learning community or learning network" (p. 6). Van Belle (2002) added that collaboration and communication with both peers and instructors are major components of active learning.

Online Threaded Discussion Forums

The research presented in this study specifically focuses on the implementation of a means of asynchronous communication known as online threaded discussion forums. Online threaded discussion forums are the principal interactive component in distance learning (Schrire, 2006). In an analysis of asynchronous learning environments, Bourne (1998) found that 40 percent of interaction in online environments was accountable to threaded discussion forums. Further, Bourne found that in online environments, threaded discussion forums accounted for 80 percent of what is described as learning with others. This grounds online threaded discussion forums as an important part of the learning process. MacKinnon (2000) asserted that the effectiveness of online threaded discussion forums plays a role in the overall quality of distance education. Kirk and Orr (2003) cited research that indicated that online threaded discussion forums were excellent tools for engaging students online by offering five instructional benefits. First, online threaded discussion fostered lively interaction between students and between students and instructors. Second, they served as catalysts for active learning, group learning, and other types of learning requiring dialogue and the exchange of ideas and concepts. Third, they promoted the development of learning communities. Fourth,

they motivated students to become highly engaged in their learning activities. Finally, they were well suited to covering topics that may be too sensitive, controversial, or personal for some students to discuss face-to-face.

Xia (2002) concluded that CMC allowed for similar communications as did face-to-face. This reinforced the educational advantages that were previously listed supporting the use of the discussion teaching method in a face-to-face environment. Xia acknowledged that computer-mediated communication took more time when compared to face-to-face communication. Researchers (Brookfield,1995; Gall & Gall, 1990) analyzing face-to-face discussion stated that discussion was particularly appropriate for social analysis, synthesis, and evaluation of instructional content. Winiecki (2003) discussed these areas in relationship to electronic discussion.

Because computer-mediated communication also carries some disadvantages, online threaded discussion forums are not a be-all and end-all educational tool. As Pena-Perez (2000) stated, "Just as writing did not replace oral communications, the use of CMC will not replace other forms of human communication" (p. 28). The removal of time constraints in communications can create an overload of information for both instructors and students (Hara, Bonk, & Angeli, 2000). Horton (2001) added that engaging students in online threaded discussion can add hours to instructors' course loads and/or distract from other coursework. A major difference between face-to-face communication and CMC, which was been long ago documented by Sproull and Kiesler (1986), was the lack of social cues. This was referred to in the world of CMC as the social presence theory. Social presence was the degree to which a person feels "socially present" or is perceived as a "real person" in computer-mediated communication (Short, Williams, & Christie, 1976). In face-to-face

communication social cues can contribute up to 70 percent of the dialogue's meaning (Sproull & Kiesler, p. 1492). Users of online text are able to overcome some of this loss through the use of emphasis and emoticons. Emoticons (also called smilies) consist of punctuation marks combined to represent feelings, such as smiles :-) winks ;-) or sadness :-(. Another factor that lessens the effect of losing visual cues was that as users gained more experience in electronic discussion, social communication patterns could be detected by the discussants who will gradually reveal things (Winiecki, 2003). However, Berge and Collins (2005) suggested that participation levels could be equalized by masking social cues. Unfortunately, the lack of social cues may also lead to antagonistic behavior between some students (Pena-Shaff, Martin, & Gay, 2001). Sherry (2000) pointed out additional limitations: Students need writing and typing skills for participation, the presence of a time lag could lead to sluggish discussion, and the presence of multiple, simultaneous threads of discussion could possibly lead to confusion.

Interaction Types

Moore and Kearsley (1996) defined three types of interaction: learner-content, learner-instructor, and learner-learner. In face-to-face and online education, some form of participatory interaction is deemed critical for success (Kearsley, 1995). Interaction from multiple perspectives was considered essential in online learning by Khine, Yeap, and Lok (2003). Moore and Kearsley stated that the interaction of student with content was a defining characteristic of education. They continued, "Every learner has to construct knowledge through a process of personally accommodating information into previously existing cognitive structures" (p. 128).

The second type of interaction was learner-instructor. Moore and Kearsley (1996) stated that this interaction was "regarded as essential by learners and as highly desirable by most educators" (p. 2). They also stated that after the content has been presented, the instructors assist the students in interacting with it. This assistance can take many forms. Organization, support, encouragement, motivation, and providing examples students can relate to are some of the learner-instructor interactions that are possible. The instructor's interaction with students can take a one-to-one or a one-to-many form.

The third type of interaction was learner-learner, which can alternatively be identified as inter-learner and can take place with or without an instructor. Historically, the focus of interaction has been with the first two types (Sutton, 2001). According to Garrison (1990), research indicated that learner-instructor and learner-learner interactions resulted in more motivated students who have better learning experiences. Inter-learner discussions were an extremely valuable way to help students think out the content that has been presented and to test it in exchanges with other students (Moore and Kearsley, 1996).

Learner-interface was a fourth type of interaction and is not found in face-to-face classrooms (Hillman, Willis, & Gunawardena, 1994; Prammance, 2003). This interaction described the usability of the computer interface for the student (Martyn, 2004), and was used to implement the computer-mediated communication process (Sutton, 2001). In the CMC environment, learners must utilize the learner-interface interaction to achieve the previous three types of interaction.

Sutton (2001) defined vicarious interaction as a fifth interaction type, taking place when a student actively observes and processes both sides of a direct interaction between two other students or between a student and the instructor. Sutton postulated that this vicarious

interactor was involved in the process of vicarious learning. Sutton also added actors and non-actors to the existing group of direct and vicarious interactors. Actors were those who provided unilateral input regardless of the reactions or comments of others, and non-actors did not participate in the communication process at all.

More common in the literature is the concept of active versus passive listeners (Romiszowski & Mason, 2004). Similar to Sutton's (2001) vicarious interactor, or to the silent listener previously mentioned in the Discussion Teaching Method section, passive listeners may read and process information, but not join in conversations. Shapard (1990) referred to these passive learners as *lurkers*. Taylor (2002) went further by dividing online interactors into three groups; workers, lurkers, and shirkers. Lurkers read other peoples' electronic conversations, but posted few if any of their own. Shirkers didn't read any of the information and made no postings. The same can be said for in-class discussion, but an instructor may have some visual clues between lurkers and shirkers in a face-to-face classroom.

Model for Online Interaction Learning Theory

The purpose of detailing the description of interaction is that these interactions are the process portion of the input-process-output model proposed by Fjermestad, Hiltz and Zhang (2005), which served as the backdrop for the publication *Learning Together Online: Research on Asynchronous Learning Networks* (Hiltz & Goldman, 2005). Figure 5, which follows, summarizes the model.

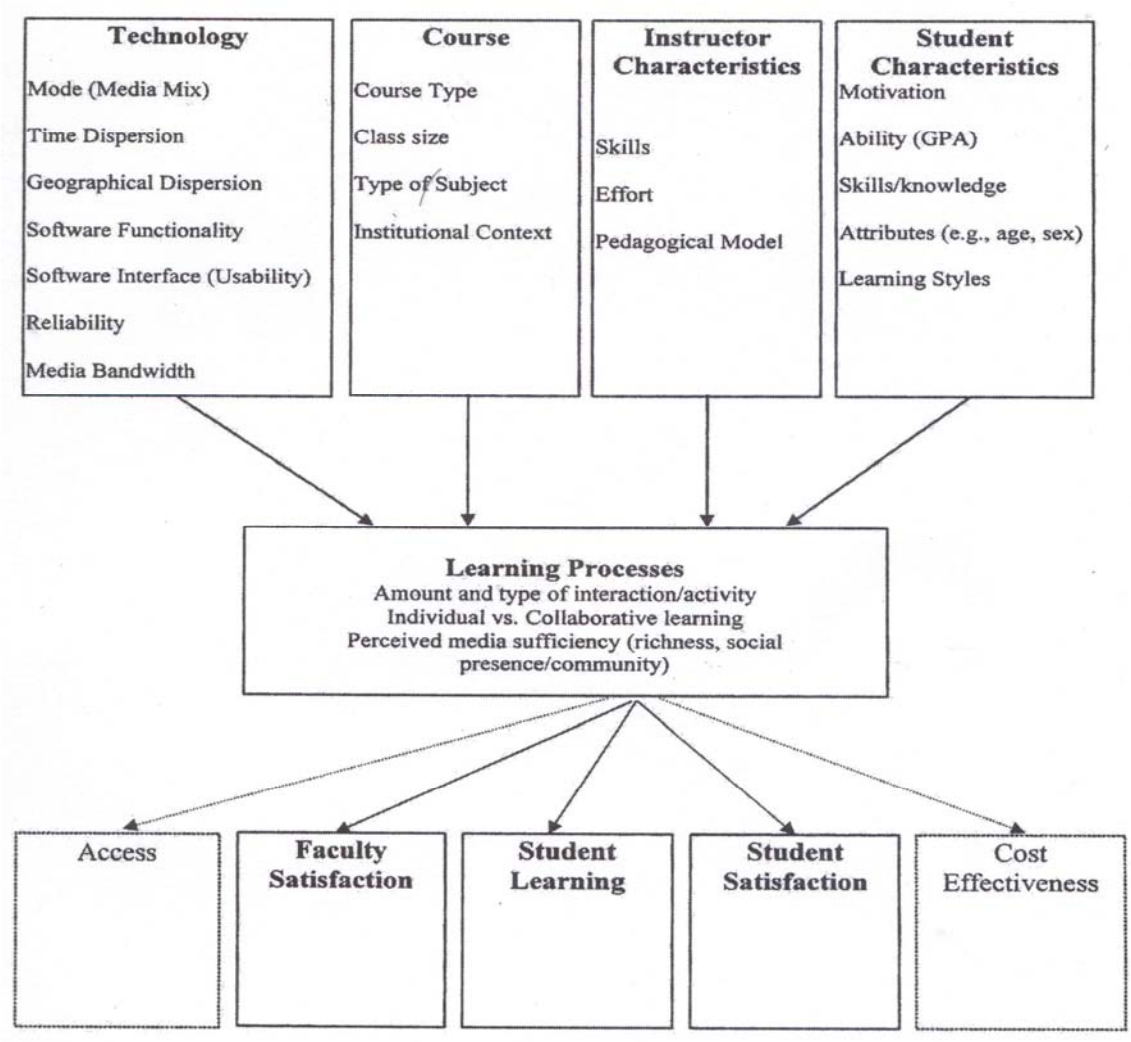

Figure 5. Online interaction learning theory (Fjermestad, Hiltz and Zhang, 2005).

Learning through Participation in Threaded Discussion Forums

Greenlaw and DeLoach (2003) report that "Instructors across a variety of curricula suggested a range of active learning pedagogies to promote critical thinking. By and large, these suggestions used one of two media: writing assignments or class discussion" (p. 40). Online threaded discussion forums combine both. "An important instructional benefit of asynchronous communication, therefore, is its potential to support the co-construction of knowledge through discourse" (Gilbert & Dagbagh, 2005, p. 6).

An ideal set of research findings to support the inclusion of online threaded discussion forums as a supplement to classes would address three elements. The first would be an objective measure of student performance comparing classes with online threaded discussion forums to those without. The second element needed would be an experimental design utilizing the random assignment of students to a control group (regular class) versus a treatment group (class supplemented with an online threaded discussion forum), and third, the assumption that all other factors were constant between the two groups. If random assignment of subjects to groups is not possible, which is often the case in educational research, then a covariate should be utilized. Cumulative grade point average (GPA) or a standardized test score could be beneficial in explaining the percent of variation in student performance attributable to differences in previous academic achievement. In reviewing hundreds of research findings, no single report could be located that addressed these two elements together. Several researchers stated the need for more quality literature (Bernard et al., 2004; Romiszowski & Mason, 2004).

In their analysis of research relating to computer-mediated communication, Romiszowski and Mason (2004) cited Mayadas (1997):

> The literature on the topic is large and growing, but most is anecdotal rather than empirical. The many outstanding research questions will not be resolved quickly, since many variables need to be accounted for and control groups established for comparisons, which is a difficult task in real-life "intact" educational environments. (p. 399)

Bernard et al. (2004), studying distance education comparison reviews stated:

> We find only fragmented and partial attempts to address the myriad of questions that might be answerable from the primary literature; we also find great variability

> among the findings but general agreement concerning the poor quality of the literature. (p. 386)

Three large collections and a group of individual reports were identified that addressed online threaded discussion forums as a supplement in face-to-face classes in some way. Since direct research—research which contained random assignment and an objective measure of student performance comparing face-to-face classes with online threaded discussion forums to those without—was unavailable, this study will attempt to support the premise that participation in online threaded discussion forums has an impact on student learning by citing the following related research.

First, Fjermestad, Hiltz, and Zhang (2005) reported on findings gleaned from the Web Center for ALN Effectiveness Research. Starting from the database of over 100 empirical studies, 30 were selected for analysis. Second, Russell (2001), who was the leading proponent of the "No Significant Difference Phenomenon," maintained a website and was on the fifth edition summary of 355 reports (at the time of this study) comparing technologically-mediated and/or distance education to the traditional classroom. Finally, in what appeared to be the most comprehensive and statistically rigorous study to date, Bernard, et al. (2004) compared distance education with traditional classroom instruction. Of the 2262 research abstracts comparing distance education to the traditional classroom, 232 met the ten factor inclusion/exclusion criteria and were included in Bernard et al.'s meta-analysis.

Web Center for ALN Effectiveness Research

To be included in the report titled "Effectiveness for students: Comparisons of in-seat and ALN courses" (Fjermestad, Hiltz, & Zhang 2005), studies must have met several criteria. The studies needed to be considered within the domain of ALNs and the technology and

pedagogy must have included computer-mediated communication among students and between instructors and students for a substantial portion of the course work. The studies needed to include research questions or hypotheses (at least implicitly), be full papers of five pages or more, and measure effectiveness. Effectiveness, which was primarily concerned with learning outcomes for students, also included student and faculty perceptions of effectiveness, student satisfaction, and student performance in ALN learning factors (interaction, activity, collaborative learning, media sufficiency, etc.). Many studies contained multiple measures and overall more than 40 percent of the measures provided an objective measurement of student learning. Some examples of objective measures of student learning included course grade, mid-term or quiz grades, homework assessments, and final exam grade. Regardless of the measure, results were summarized into one of three categories, "positive results for ALN", "no difference between ALN and in-seat courses", and "negative results for ALN". Table 2, which follows, provides summary results.

Table 2. *Effectiveness for students: Comparisons of in-seat and ALN courses (Fjermestad, Hiltz, & Zhang 2005).*

Measure	Positive for ALN	No Difference	Negative for ALN
Learning Processes	11	7	9
Access	3	1	0
Student Satisfaction	5	4	3
Objective Measures (of learning)	16	29	2
Subjective Measures (of learning)	15	5	1
Cost	1	1	1
Grand Totals (112)	**49 (43.8%)**	**47 (41.9%)**	**16 (14.3%)**

The results indicated that, in general, 85 percent of the studies reported that the measures of the effectiveness of ALNs was equal to or greater than the measures of effectiveness for in-seat (traditional face-to-face) classes. Therefore the concept of "No Significant

Difference," which will be explored next, is supported. Additionally, the overall numbers represent a nearly equal split between the categories of "positive for ALN" and "no difference." A notable and conceptually significant difference in the nearly equal split between "positive for ALN" and "no difference" is contained in the results of the objective versus subjective measures of learning. Far fewer objective measures of learning were "positive for ALN" compared to the "no difference" category, and the reverse was true in the subjective measures of learning studies. The importance of this difference will be addressed further in the section that follows titled "Individual Comparisons." At the time of this study, the Web Center for ALN Effectiveness Research was located at http://www.alnresearch.org.

The No Significant Difference Phenomenon

Put simply, Russell (2001) postulated that students learned equally well in distance education classes as compared to traditional classes. This conclusion was based on a growing set of research dating back nearly 80 years. An underlying theme in Russell's message was that lower cost delivery of education can make education dollars go further. Russell, whose area of expertise included instructional television, was a strong proponent of low-cost technology systems over high-cost technology systems. Specifically, Russell stated

> by heeding research and carefully downsizing the technology it is possible to:
> Lower cost of instructional television by a factor of 100, perhaps 1000;
> Increase course offerings by a comparable number;
> Attract, by a similar factor, more volunteer instructors;
> Fulfill many more educational needs of the community;
> Serve very small as well as large publics;
> Respond quickly with finished, readily updated distance instruction;
> and, under certain conditions where revenues (tuition) can be generated, provide self-supporting, even profitable, operations. (p. 99)

There have been numerous criticisms of research relating to distance education (Clark, 1983; Clark, 1994; Joy & Garcia, 2000; Phillips & Merisotis, 1999; Rampage, 2002). Russell's No Significant Difference Phenomenon has been the focus of some of this criticism (Joy & Garcia, 2000, Rampage, 2002). Clark, in support of Russell, has tied his criticism to the technology.

Clark's (1983) often quoted statement is "The best current evidence is that media are mere vehicles that deliver instruction but do not influence achievement any more than the truck that delivers our groceries causes changes in our nutrition... only the content of the vehicle can influence achievement" (p. 445). Clark also implored researchers to "give up your enthusiasm for the belief that media attributes cause learning" (p. 457). This debate is particularly pertinent to research in distance learning, including computer-mediated communication, ALNs, and online threaded discussion forums because these types of learning are heavily dependent upon media. Clark went on to state that "there are no benefits to be gained from employing different media in instruction" (p. 450). Gagne, Briggs, and Wager (1992) supported some of Clark's contentions and did not indicate that media per se influences learning, but they did state that media is "the vehicle for communications and stimulations that make up instruction" (p. 205).

Kozma (1994) and Cobb (1997) countered Clark's (1983) claim of media irrelevance. Kozma stated that technology selection is as important as instructional methods and contended that media can provide powerful new methods and those methods can take advantage of the media capability. Media and learning are complementary processes and media had the ability to engage learners through interaction. Cobb's argument, labeled "cognitive efficiency", held that media selection did have a relationship to learning

outcomes. Instructional designers were urged to choose specific media if that selection increases the student's efficiency of learning when compared to other possible choices of media.

Opponents of the no significant difference phenomenon included the American Federation of Teachers and the National Education Association, who funded a study by The Institute for Higher Education Policy authored by Phillips and Merisotis (1999). The study highlighted four key shortcomings of the original research on the effectiveness of distance learning which Russell (2001) had cited. First, much of the research did not control for extraneous variables and therefore could not show cause and effect. Second, most of the studies did not use randomly selected subjects. Third, the validity and reliability of the instruments used to measure student outcomes and attitudes were questionable. Finally, many studies did not adequately control for the feelings and attitudes of the students and faculty—what the educational research referred to as "reactive effects."

One might question, however, how much educational research could pass the rigors of the criteria implied in the Phillips and Merisotis (1999) study. Russell (2001) defended his compilation, not with support of the research methodology of the studies he cited, but with the following:

> I have also challenged anyone to create a listing of comparable studies showing that technology was beneficial. No one I know has accepted that challenge; I feel certain that some have tried and realized the futility of the search. (p. xiii)

Rampage (2002) summarized in a rebuttal "that Phillips and Merisotis, as well as Russell, make individual studies indefensible by lumping all research concerning effectiveness of technology in education into one overarching 'No Significant Difference bucket' and over-

generalizing when evaluating the research" (¶ 17). Russell's web site, at the time of this study, was located at http://www.nosignificantdifference.org.

Individual Comparisons

A manual search of the www.ALNresearch.org web site was conducted to see how many research findings reporting objective measures of student performance, such as tests, homework scores, or course grades, could be identified as having a relationship to this study. The numerous studies reporting subjective measures of student performance, specifically students' own perception of their learning, were intentionally excluded from analysis for three reasons. First, as identified in Phillips and Merisotis's (1999) report "What's the Difference," was the novelty effect. The novelty effect refers to "increased interest, motivation, or participation on the part of students simply because they are doing something different, not better per se" (p. 21).

The second reason dealt with accuracy of students' estimate of their own learning. Cann (2005) called into question students' ability to predict their own course grade which, in turn, raises a question about students' self-perception of learning. Cann's study, which included over 700 students, found that students' prediction of other students' grades were not statistically different than the actual grades those students received. The students' prediction of their own grade was; however, greatly overestimated. In fact, of the 22 percent who received a *D* or *F*, none thought they had received lower than a *C*. Forty-six percent of the students received an *A* or *B;* however, in students' estimate of their own grade 97 percent, more than double the actual, felt they earned an *A* or *B*.

The third reason subjective measures of student performance were excluded from individual comparisons was because in Table 2, which cited learning outcomes between

ALN and traditional methods, the ratio of ALN methods outscoring traditional methods varied dramatically depending on whether student performance measures were objective or subjective. In subjective measures of student performance, the ratio of "positive for ALN" compared to "no difference" was three-to-one favoring "positive for ALN" (15 studies compared to five). When objective measures of student performance were used the ratio became two-to-one in favor of "no difference" (16 studies compared to 29). Although the data represented were summary only and no statistical conclusions can be drawn, the differences in results between subjective and objective measures of student performance were noteworthy.

Of the 197 articles posted on www.ALNresearch.org in August 2006, seven that dealt with objective measures of student performance were analyzed. In an analysis of those seven studies, student performance in environments utilizing online threaded discussion forums was sometimes better and sometimes the same, but not worse than student performance without online threaded discussion forums. One can conclude that in some cases, online threaded discussion forums may have increased student learning.

Measuring, Scoring, & Evaluating Threaded Discussion Forums

Several approaches existed for the measurement, scoring, and evaluation of online threaded discussion forums. A major distinction presented in this study will be between the researcher approach, which is theory-based, and the practitioner approach which is application-based. Since the theoretical base should be examined before discussing application, the research-based approach will be presented first. Possible scenarios for an

instructor to evaluate (score) individual students' participation in online threaded discussion forums will follow.

An important purpose for analyzing the content of discussion was to establish if student learning has taken place. This is especially true in light of the claims of knowledge construction, critical thinking, and active learning that were commonly associated with online threaded discussion forums. A common theme in the research was the concept of content analysis, which has gone from a rarity in face-to-face discussion to commonplace in online threaded discussion forums since an electronic transcript is a by-product of the discussion itself. To create a transcript in a face-to-face environment, a great deal of time and expense would be involved to first record the interaction and then transcribe it for analysis. In addition, the intrusion of the recording itself may have altered the interaction that did occur.

Research on Measurement, Scoring, and Evaluation

Unlike earlier analysis, which gathered data about interaction or the frequency of participation, content analysis aimed to unlock information captured in discussion forum transcripts (de Weaver, Schellens, Valcke, & van Keer, 2006). Although numerous studies existed describing methods of content analysis (Henri, 1991; Hass, 1996; Hiltz and Turoff, 1993; Newman, Webb & Cochrane, 1995; Olson & Olson, 2000; White, 1993), Valcke and Martens (2006) pointed out that more accurate research methods were required to obtain more detailed information about the processes studied in computer-supported collaborative learning when they reported the state of research in CSCL.

The content analysis schemes previously mentioned are primarily quantitative in nature. Schrire (2006) approached content analysis with both a qualitative and quantitative methodology which Schrire described as being analytic and holistic. Hmelo-Silver (2003)

agreed with the use of qualitative analysis and raised caution about the use of reductionist approaches of message coding through content analysis amidst the complexities of collaborative knowledge construction. In support of content analysis as a first step, Schrire provided the strategy that "going beyond quantitative analysis means that first such a quantitative analysis has to be performed" (p. 53). By using the fine-grained content analysis of the discourse, it would be possible to move from the quantitative analysis to the level of understanding needed for holistic explanation. In Schrire's words "The world needs to be interpreted rather than measured" (p. 52).

Having analyzed three graduate-level online threaded discussion forums, Schrire (2006) identified two primary types of interaction; instructor-centered, and synergistic, with synergistic defined as explicit or implicit interaction to other students' threads (messages) in the forum. That distinction in types of interaction had also been reported by Lipponen, Rahikainen, Lallimo, and Hakkarainen (2003). A triangulation of three indicators of cognition was performed by Schrire. The three indicators used were Bloom's (1956) taxonomy (Bloom, 1956), the SOLO taxonomy (Biggs & Collis, 1982), and the practical inquiry model of cognitive presence (Garrison, Anderson & Archer, 2000; 2001). Using these cognition indicators, Schrire determined that higher level cognition was associated with the synergistic interaction pattern when compared to the instructor-centered interaction pattern.

Application of Measurement, Scoring, and Evaluation

A criticism of measuring frequency data concerning participation was that the resulting data was considered surface-level information (de Wever, Schellens, Valcke, & van Keer, 2006; Schrire, 2006; Strijbos, Martens, Prins, & Jochems 2006). On the other hand, the time

and effort required to perform the various content analyses previously described limited their use primarily to researchers. How can measurement, scoring, and evaluation of online threaded discussion forums be accomplished by instructors wishing to provide a participation score to a group of students in one of perhaps several classes they teach?

Brace-Govan (2003) summarized the potential overload:

> For example, an online class of 20 students communicating in the forum twice a week with half a page each time would generate 200 pages in 10 weeks. A moderator responsible for two or three online discussion forums would have to read 400-600 pages of interaction by the tenth week. Clearly, busy teaching staff needed a method to track, record, and organize information about what was happening in discussion forums in a quick, easy, and succinct manner. (p. 305)

An additional limitation is that content analysis needs to be done by coders with a background in linguistics or discourse analysis, and a minimum of two coders with this capability are required to establish inter-rater reliability (Schrire, 2006). Clearly, a method for instructors to evaluate students' participation in threaded discussion forums lies outside the content analysis realm.

The literature on application-level evaluation rubrics for threaded discussion forums was less plentiful compared to the literature on content analysis. Fortunately, this is not a problem because many of the evaluation rubrics for face-to-face discussion, which were reviewed earlier, can be modified to serve as evaluation rubrics for their online discussion counterparts. Schire (2006) cites Hannafin and Kim's (2003) recomendation that "the wheel does not need to re-invented when moving into the online dimension (p. 50)." Schire adds that CMC and CSCL "can, and should, rest on the existing knowledge base of learning processes (with and without technology) and extrapolate from it what is relevant" (p. 50).

A seven-step approach for developing a rubric to evaluate and score students' participation was developed by Schreyer Institute for Teaching Excellence at The Pennsylvania State University (n.d.): (1) define the assignment; 2) determine the areas you want to assess; (3) determine the type of rubric or scoring guide you should use; (4) define the key components; (5) establish standards for performance for each assessment component; (6) develop a scoring scale; and (7) adjust the rubric or scoring guide as needed. Researchers and practitioners may wish to take into consideration a rubrics' adherence to the above steps. As was the case with the face-to-face discussion rubrics, a description of the online threaded discussion rubrics and accompanying tables have been included in the appendices. Appendix D contains the information for online threaded discussion rubrics.

Factors

The factors section of this literature review is organized as follows. Factors are broken down into two general types. Apprehension and anxiety (factor one) are discussed in general then Classroom Communication Apprehension (CCA) and the composite factor of Computer-Mediated Communication Apprehension (CMCA) are analyzed. CMCA combines dimensions of general communication apprehension, computer anxiety, and writing apprehension. Technological aspects (factor two) are then addressed. The first is a composite factor named Computer-Email-Web fluency which deals with students' skill level (or fluency) in those three areas. The other technological factor addressed is students' access to online threaded discussion forums.

Fassinger (1995a; 1995b; 2000) identified three broad areas of factors that influenced students' participation in classroom discussion: namely (1) class traits, (2) student traits, and

(3) instructor traits. Of particular interest to this study is the student trait of confidence and its inclusion as a part of classroom communication apprehension.

Individual learner characteristics also constrained the use of online conferencing and other CMC tools (Sherry, 2000). The variation in the use of CMC tools was significantly related to a number of learner characteristics: computers use, gender, and communication apprehension (Fishman, 1997). Bandura (1982) added confidence in using new tools and the perceived value of performing an assigned task into the individual's personal mix of factors. Sherry (1998) found that students using online threaded discussion voiced the following concerns: First, they needed to see some intrinsic value in learning new technologies. Second, finding a voice and having something to say was a concern, especially not knowing what content to put in public messages. Finally, the types of dialogue carried out in class-related electronic conferences needed to be consistent with one's lifestyle and self concept.

Apprehension and Anxiety

A multitude of names existed that described the condition which Horwitz (2002) labeled the "hidden communication disorder." It was labeled as such because frequently it was not recognized, acknowledged, or discussed. Names associated with it included: reticence, shyness, unwillingness to communicate, communication anxiety, performance anxiety, stage fright, speech anxiety, social anxiety, audience sensitivity, and communication apprehension. Concepts relating to this condition have been around since the mid 1930s (Henning, 1935; Lomas, 1934; as cited in McCroskey, 1982). Burgoon (1976b) developed a scale to measure unwillingness to communicate, Phillips (1968) advanced the idea of reticence, and the term communication apprehension (CA) was made popular by McCroskey's (1970) seminal work

Measures of communication-bound anxiety. During the decade that followed, McCroskey was the single or lead co-author of over 25 professional articles with communication apprehension in the title. In total, more than 200 reported studies of CA appeared between 1970 and 1980 (McCroskey, 1982). By 1983, nearly 1,000 articles and papers regarding CA and related constructs had been published (Payne & Richmond, 1984). Marshall (1934, as cited in Horner, 1989) reported that 30 to 40 percent of the general population considered public speaking their number one fear. For these people, fear of public speaking surpassed fears of loneliness, sickness, heights, and the dark. The Bruskin Associates (1973, as cited in McCroskey, 1977b) offered similar findings in their report, *What are Americans afraid of*. More feared than snakes, heights, disease, financial problems, or even death, was speaking before a group. McCroskey (1977b), with a more limited definition of CA, reported that extensive studies indicated that approximately 20 percent of students at major universities had been appropriately described as having high-trait CA, with still higher rates in smaller colleges and community colleges. McCroskey (1977a), labeled students with high levels of CA as *handicapped*, although the term finds disfavor in the climate of political correctness.

Definitions of communication apprehension and related constructs have undergone change. McCroskey (1970) originally conceptualized CA as a personality trait orientation and defined it as "a broadly based anxiety related to oral communication rather than a variety of types of communication-bound anxiety"(p. 270). In a subsequent modification, McCroskey (1977b) expanded the focus beyond oral communication and then defined it as "an individual's level of fear or anxiety associated with either real or anticipated communication with another person or persons" (p. 78).

McCroskey (1977b) stated that although the terms reticence, unwillingness to communicate, and communication apprehension have been used interchangeably, doing so "has lead to confusion in the application of the research from one area within the context of another" (p. 78). Reticence and unwillingness to communicate are more global and refer to multiple causes in which the trait of an individual leads the person to characteristically remain silent rather than participating in communication. Communication apprehension is a sub-construct and anxiety was identified as the only cause of this characteristic behavior pattern. A further understanding of anxiety revealed the multiple dimensions of CA. Numerous instances in CA research distinguished between trait-based or state-based anxiety (McCroskey, 1977b; Booth-Butterfield, 1988; Daly, 1991). The anxiety of a professional performer walking onto stage at a major event may be different than the anxiety of a college student who chooses not to raise their hand in class to ask a question. Horwitz (2002) provided descriptions of common anxiety types that aided in an understanding of the differences in the constructs associated with CA (as shown in Table 3 which follows).

Table 3. *Types of anxiety (Horwitz, 2002).*

Transient Anxiety	Common phenomenon accompanying life changes, such as separation of children from parents, first dates, new jobs, moving, or loss of loved ones.
Anticipatory Anxiety	Surfaces when people dwell on future potential foul-ups.
State Anxiety	Suffered in a particular situation or with a particular person. Can manifest in any or all of the cognitive, physiological, or behavioral anxiety components.
Trait Anxiety	Individual's typical level of anxiety independent of specific threatening or dreaded environments.

In the preceding examples, the anxiety of a professional performer walking onto stage at a major event was probably suffering from what is commonly referred to as stage fright. Stage fright is identified with state anxiety. The anxiety of a college student who chooses not to raise their hand in class to ask a question was probably a trait anxiety. However, one needed to know the regularity and conditions under which the anxiety existed before making a definitive classification. McCroskey (1977b) stated that:

> While state CA is a normal experience of most people, trait CA is not characteristic of normal, well-adjusted individuals. People with high levels of trait CA characteristically experience high levels of apprehension about almost all oral communication encounters, both those which rationally could be described as threatening and those which could not be so described. (p. 79)

The trait/state distinction caused yet another modification in the definition of CA. McCroskey's 1981 definition stated that "CA is currently viewed as a person's fear or anxiety with any form of communication with other people, experienced either as a trait-like, personality-type response or as a response to the situation constraints of a given communication transaction" (p. 5).

In order to identify communication apprehension a measurement mechanism is needed. Behavioral observations or ratings, physiological assessments, and self reports have been three major ways in which CA has been measured (Daly, 1991). All three have a research history, and correlation between the measures is low or very low. Behavioral observations relied on visible signs such as nervousness or fear in a speaker. Physiological assessments relied on measurable attributes such as blood pressure, heart rate, and body temperature. Self-reports were the most common method used. Because CA is based on anxiety, an internal construct, self-reports provided the potentially most valid measures of CA (Horner, 1989).

Horner added that physiological assessments and behavioral observations provided only indirect evidence of trait CA and were therefore deficient approaches.

Daly (1991) reported that, of the more than 50 different self-report measures in the literature, McCroskey's (1984) Personal Report of Communication Apprehension was the most commonly used. After undergoing numerous revisions, the PRCA-24 version consisted of 24 items that divided CA into four subscales (public speaking, meetings, groups, and dyadic exchanges). The PRCA-24 had well-established validity and excellent reliability. CA levels were specified using the mean and standard deviation of a sample of more than 20,000 subjects. An individual was assessed as having a high level of CA if their score fell more than one standard deviation above the mean on the PRCA-24. Likewise, an individual was assessed as having a low level of CA if their score fell more than one standard deviation below the mean on the PRCA-24.

If one conceptualized communication apprehension as a personality trait then association with other personality traits was possible. McCroskey (1977b) cited McCroskey, Daly, and Sorenson (1976) who found the following correlations between CA and other factors.

> Moderately high positive correlation with general anxiety;
> Moderately high negative correlation with tolerance for ambiguity, self control, adventurousness, surgency, and emotional maturity;
> Significant but less meaningful positive correlations between dogmatism, external control orientation, trustfulness and Machiavellianism;
> Significant but less meaningful negative correlations with cyclothmia, dominance, character, confidence, and need to achieve;
> No significant correlations with intelligence, sophistication, self-sufficiency, sensitivity, eccentricity, or radicalism. (p. 84)

Based upon those correlations the description of a person identified as either high or low in communication apprehension began to emerge. McCroskey (1977b) illustrated with the following:

> The picture of the person with a high level of CA that emerges from these studies generally is a negative one. Such a person might be described as typically an introverted individual who lacks self-esteem and is resistant to change, has low tolerance for ambiguity, and is lacking in self-control and emotional maturity. Persons at the other end of the CA continuum, on the other hand, might be described as typically adventurous, extroverted, confident, emotionally mature individuals with high self-esteem, tolerant of ambiguity, and willing or even eager to accept change in their environment. (p. 84)

Building upon these personality characteristics, Daly (1991) operationalized the social, occupational, and educational aspects of high CA individuals. Socially, high CA individuals had fewer friends and over half of those friends were family members. They interacted less often with strangers, were less innovative, and took few leadership roles in the community. From an intimate relation standpoint, they were less likely to date around and less likely to accept blind dates. When examining actual verbal behaviors, high CA individuals were able to remember less of actual conversations than low CA individuals.

Since a person's ability (or willingness) to communicate was a critical prerequisite for success in many occupations, Daly (1991) cited research from the workplace. High CA individuals were perceived less positively and were offered significantly lower starting salaries, they were generally less satisfied once on the job and moved up the organizational ladder more slowly. In meetings, high CA individuals participated less and when they did

offer ideas and suggestions the credit was often given to more talkative individuals who picked up on and expanded the idea originated by the high CA worker.

Willingness or ability to communicate also played an important role in education. Horner (1989) defined five areas in which communication apprehension was related to educational experiences: (1) academic achievement; (2) classroom behaviors of students; (3) student attitudes towards education; (4) student preferences for instructional strategies; and (5) student achievement expectations of instructors.

Scholars have found that teachers had a positive bias toward talkative children in their classroom. Although no correlation existed between CA and intelligence, evidence suggested that by the time students left high school, low apprehensives were academically more prepared. Lower CA individuals did better on standardized measures of achievement and once in college, had higher grade points (McCroskey & Anderson, 1976). Bourhis and Allen (1992) conducted a meta-analysis of data from 30 research reports. They concluded, "A small but stable relationship existed between CA and cognitive performance. The small correlation (r = -.12) indicated that as CA increased, cognitive performance decreased" (p. 73).

McCroskey & Payne (1986) provided data for dropout (withdrawal from school) rates of apprehensives. In a two-year study the overall dropout rate of the sample was similar to the overall rate within the university (29.5% versus 29.4%). Students classified as high CA had a dropout rate of 32.7% and students classified as low CA had a dropout rate of 23.9%. As one might suspect, the drop rate for a specific class in public speaking was much higher. Between 50 and 70 percent of high CA students dropped the public speaking class within two weeks,

even though it was a required course. This compared to an attrition rate in the same class of between five and ten percent of students classified as either low or moderate CA.

In an educational world where communication is a necessity "apprehensive students, through years of veiled discrimination, must feel the impact of this bias in a series of significant, long-lasting consequences" (Daly, 1991, p. 7). McCroskey (1977) cautioned; however, that persons with high CA may not share the view painted of them.

> To begin with, we should not assume that every person with high CA would prefer to change places with someone with a lower level. Most adults with high CA are adjusted to their lives… In similar fashion, one should not assume that the low CA individual is necessarily ideal. (p. 92)

McCroskey urged future research on low levels of CA and cautioned not to be surprised if negative consequences of low levels of CA were also identified.

Classroom Communication Apprehension (CCA)

Classroom Communication Apprehension (CCA) is a specialized form of generalized CA and is more situation specific, or state-like in nature. Neer (1987) defined CCA as "avoidance of participation prompted by evaluation apprehension or expectations of negative associations with participation" (p. 157). Upon further research, Neer (1990) expanded CCA to include five dimensions: nervous discomfort, approach-avoidance behavior, communication confidence, communication competence, and evaluation potential. Neer (1987; 1990) and Near and Kirchner (1989) have identified the following factors which can arouse CCA: instructor challenges of students to answer questions, not announcing discussion topics ahead of time, uncertainty of instructors' expectations, and lack of familiarity of classmates.

As previously mentioned, McCroskey (1977b) had concluded that 20 percent of college students were classified as high CA, based on scoring more than one standard deviation above the mean on the PRCA-24 instrument. Similar percentages were found by Bourhis and Allen (1992). Although McCroskey's PRCA-24 had been used in classroom settings (Taylor, 1998; Phillips, Smith, & Modaff, 2001), Neer (1987) developed the Class Apprehension Participation Scale (CAPS) to be a more specific measurement instrument because classroom participation differed from either public speaking or speaking in meetings, both of which the PRCA-24 measures. Whereas PRCA-24 was focused on perceived anxiety and nervousness, CAPS was developed to identify observable communication during class participation (Neer). With this goal in mind, CAPS functioned as a state-based rather than a trait-based instrument, providing situation-based information which may have indicated potential sources of treating CCA. The following examples provided evidence of observable classroom behavior. Neer found that high apprehensives preferred to participate in classes with less than ten to 15 students, were less likely to participate when they needed a point of clarification, and that 32 percent of high apprehensives participated when they were interested in the discussion topic as compared to 95 percent of low apprehensives who were interested. Near and Kirchner (1989) found that students who were high apprehensives paid less attention. Olaniran and Stewart (1996) found high apprehensives preferred that discussion center on assigned reading materials. McCroskey and Sheahan (1976) identified a seating preference behavior of high apprehensives in their avoidance of high interaction seats, namely front and center of the classroom; however, Neer, found contradictory results. Burgoon (1976a; 1976b) found high apprehensives more tense during classroom discussion.

Bowers and 36C:099 (1986) indicated a high number of college students identifying with a single question representing communication apprehension. Students were presented with the following scenario:

> You're attending a class here at the University. It's a class in which students sometimes make comments or ask questions, and you consider yourself prepared for the class. During the class, a question or comment occurs to you, and you think that your question or comment would be useful to you and useful to the class generally. Yet, because of some kind of inhibition or apprehension, you do not make the comment or ask the question. (p. 372)

Students were then asked the question, "Does this ever happen to you?" Of 402 randomly selected subjects, 281 (70%) answered "yes." The affirmative respondents were asked to specify consequences of their classroom communication apprehension. Thirty-one percent attempted to make themselves inconspicuous, eight percent skipped class, seven percent dropped a needed course and 31 percent choose "other consequences," with the most prevalent explanation being that they did not learn the required information.

In addition to Neer's seminal work in Classroom Communication Apprehension, Zhang (2005) summarized the work of researchers who tied this construct back into dimensions which McCroskey used to distinguish CA in his original work. Specifically, Zhang stated:

> A substantial body of research demonstrated that student CCA is correlated negatively with academic achievement (Comadena & Prusank, 1998), cognitive performance (Bourhis & Allen, 1992), affective learning (Messman & Jones-Corley, 2001), communication competence (Chesebro et al., 1992), instructor immediacy and clarity (Chesebro, 2003; Chesebro & McCroskey, 2001; Ellis, 1995), and students motivation to study (Frymier, 1993). (p. 110)

Computer-Mediated Communication Apprehension (CMCA)

Scott and Rockwell (1997), after analyzing the prediction of the use of new communication technologies, stated that computer anxiety alone may not have been the best indicator of use. Keeping with the apprehension/anxiety concepts of McCroskey, et al., the term computer-mediated communication apprehension (CMCA) has appeared in the literature. Scott and Timmerman (2005) identified three areas related to research in CMCA. First, anxiety about technology, specifically computer technology, represented only part of the picture. Second, reinforcing the call of Scott and Rockwell, was the need to combine measures. Third, despite some contention that apprehension may decline as users become familiar with the technology, Scott and Timmerman contended that apprehension may persist or be amplified in technology-rich environments.

Several approaches have occurred in the quest for a measure of CMCA. Some researchers (Scott & Timmerman, 2005) used existing measures for computer anxiety then reworded questions from existing CA instruments to represent apprehension in an electronic communication environment. For example, a question in their CMCA instrument was "I would enjoy giving a presentation to others online." This question simply added the word "online" to McCroskey's (1981) original question in the PRCA-24 instrument. Other researchers (Brown, Fuller, & Vician, 2002) measured constructs such as computer anxiety with existing instruments then created new questions related to CMC for their measurement of CMCA. In an example question, Brown, Fuller, and Vician asked "I am afraid of sending an email message to a large group of people." Only Clarke (1991) started anew to develop a thorough instrument grounded in the multiple constructs that Scott and Rockwell (1997) sought.

Clarke (1991) conceptualized that:

> The construct of computer-mediated communication apprehension (CMCA) was conceived as a relatively stable predisposition which will cause some individuals to experience more anxiety or apprehension than others when faced with the prospect of using a personal computer or computer terminal, with computer-mediated software (such as electronic mail), to communicate with others. (p. 5)

By placing CMCA within the predisposition framework it can be added to the general theory of communication apprehension which was previously mentioned. Therefore, Clarke (1991) postulated that the following propositions existed relating CMCA to generalized CA:

> (1) the feeling state associated with CMCA would be anxiety; (2) the effects of CMCA would be avoidance or minimization of the use of CMC systems; and (3) CMCA would be experienced by a substantial minority of a given sample of individuals. (p. 10)

In addition to generalized CA, Clarke related CMCA to eight other factors: (1) writing apprehension, (2) social-evaluative anxiety, (3) computer confidence, (4) self-assessed computer knowledge, (5) measured computer knowledge, (6) computer experience, (7) electronic mail use, and (8) computer anxiety. In the third and final revision of the instrument, self-assessed computer knowledge and measured computer knowledge were dropped because the absence of correlation with the CMCA instrument was identified through testing.

Has the addition of CMCA measurement improved the explanation of variance in the use of computer-mediated communication? Scott and Rockwell (1997) found the use of CMC to be more accurately predicted by a combination of measures of computer anxiety, communication apprehension, and writing apprehension compared to using any one of the

instruments individually. However, the best predictor of the likelihood to use 19 examples of new technology was not any type of apprehension or anxiety but whether subjects had previous experience with the technology. Scott and Timmerman (2005) divided the 19 communication technologies into three categories. They found that the addition of a CMCA measure made a statistically significant improvement in the explanation of variance in usage among all three categories and in ten of the 19 individual technologies. The Scott and Timmerman study occurred in the workplace and a second measurement of CMCA was taken five years after the first. The overall level of CMC apprehension did not show a reduction over this five-year period.

Studies analyzing college student CMC use were few, but two by Brown, Fuller, and Vician (2002; n.d.) provided an initial look at CMCA in education. In part one of their first study, Brown, Fuller, and Vician (2002) created four individual measures which were correlated with their new measure of CMCA. Computer anxiety, oral communication apprehension, written communication apprehension, and familiarity with CMC were examined. All measures except written communication apprehension were statistically significant, and, of those, computer anxiety was the strongest. Together, the four measures represented 25 percent of the variance (R^2) measured by the CMCA instrument. In part two of the study, the CMCA instrument was used to measure the students' satisfaction concerning CMC in a course, as well as students' actual use of CMC. The CMCA instrument predicted 52 percent of the variance (R^2) in students' CMC satisfaction and 12 percent of the variance (R^2) in students' use of CMC.

In a second, similar study, Brown, Fuller and Vician (n.d.) correlated five individual measures relating to their new measure of eMail anxiety. The five measures were computer

anxiety, oral communication apprehension for groups, oral communication apprehension for dyads, written communication apprehension, and eMail experience. In this study, both oral communication apprehension for dyads and written communication apprehension failed to reach statistical significance. Email experience was the strongest indicator and together all five indicators represented 68 percent of the variance (R^2) in eMail anxiety. In part two of this study, the eMail anxiety instrument was used to measure the students' use of eMail in a course. The eMail anxiety instrument predicted 22 percent of the variance (R^2) in eMail use. Taking the research model a step further than in their prior study, Brown Fuller and Vician (n.d.) used students' eMail usage to predict learning as measured by the students' grade in the course. Eleven percent of the variance (R^2) in student learning was attributed to students' eMail usage.

Several themes persisted in the CMCA research results. First, computer anxiety provided a consistent correlation with communication apprehension and it, as well as experience, provided the most significant relationships with a CMCA type of measure. Writing apprehension has provided little or no additional explanation of use (Brown et al., n.d.), drawing one to conclude that writing apprehension does not affect CMC use, even though the act of writing is involved with CMC technologies.

Technological Factors

As stated in Chapter One, fluency and access were considered under the heading of technological factors, and related to the Digital Divide. The exact origins of the term Digital Divide were unclear. The National Telecommunications and Information Administration (NTIA) issued a report in 1995 titled *Falling Through the Net: A Survey of the 'Have Nots'*

in Rural and Urban America. Although the term *Digital Divide* was not included anywhere in the report, the contents could have served as an expanded definition of the term. By the time NTIA issued a follow-up report in 1999 titled *Falling Through the Net: Defining the Digital Divide* was issued, the phrase Digital Divide was popular in research database indexes such as Educational Resources Information Clearinghouse (ERIC), PsychINFO, and CommunicationAbstracts.

Initially the Digital Divide was looked at as two dichotomous variables and was based on surveys of home computer ownership and access to the Internet (Katz & Aspden, 1997; Hoffman & Novak, 1999). These studies found the following factors correlated to the two dichotomous variables (ownership and access) of the Digital Divide: ethnic and minority group affiliation, income level, education, age, and geographic location. Harper (2003) raised the issue of two separate Digital Divides, an access divide and a social divide. Harper stated that the access divide was eliminated when the barriers to access were removed. However, "A social Digital Divide incorporates the social, cognitive, and communicative barriers proven to affect technology perception and use… factors that truly divide groups" (Harper, p. 1). Harper defined the four barriers comprising the social Digital Divide to be motivational, knowledge and skill, content, and social network. Although measurement of those four barriers fell somewhere on a relative scale, Harper viewed the access issue as simply being connected or not.

Tolbert, Mossberger, and Stansbury (2000), based on survey research of nearly 2000 U.S. residents, concluded there were four Digital Divides: access, skills, economic opportunity, and the democratic divide. Jung, Que, and Kim (2001) developed an instrument to measure Internet connectedness. Besides measuring length of home computer ownership and time

spent online, they ranked task, site, goal, and activity scope, as well as several factors measuring dependency and the effects of the Internet on personal life. Eastin and LaRose (2000) examined the Digital Divide from the perspective of an individual's self-efficacy, similar to the self-efficacy that was related to computer confidence and use. Unlike the aforementioned measures, where computer access was defined as connected or not-connected, the Eastin and LaRose study investigated whether level of access (i.e., high-speed access versus dial-up) and the students' fluency with CMC constituted any type of Digital Divide in their participation in online threaded discussion forums.

Computer Competency/Literacy/Fluency

Both Harper (2003), and Tolbert, Mossberger, and Stansbury (2000) identified skills as one of the elements in the Digital Divide. This raises two separate questions: one, what defines skills, and two, skills in what? The term computer literacy was readily identifiable in the literature. Rhodes (1986) defined computer literacy as being able to use the computer to satisfy one's own personal needs. LaLomia and Sidowski (1990), after reviewing various studies, found that although computer literacy definitions vary by study they usually contained at least one of the following elements: observed or reported skills in computer programming and/or operation, plus a knowledge, awareness, and positive attitude toward computers. LaLomia and Sidowski found that several decades ago computer skills or literacy would have been aimed at a relatively small percentage of the working population, specifically those involved in the information technology field. Now those old definitions of literacy are inadequate for a majority of computer users.

Hoffman and Blake (2003) opined that far ranging computer skills were in demand in most peoples' daily lives. Indeed the need for knowledge of computer skills went far beyond those involved in the information technology field.

Bunz (2002; 2004), Bunz, Curry, and Voon (2007), and Bunz and Sypher (2001) have continued the emphasis on fluency or competency rather than literacy, as set forward within the NAS-NRC (1999) report *Being Fluent with Information Technology* previously cited in Chapter One. Bunz, et al. have applied competency/fluency to specific aspects or applications within information technology. The Computer-Email-Web Fluency Scale (Bunz, 2002) was utilized in this study as a gauge of students' fluency in participating in online threaded discussion forums. It was deemed an appropriate instrument because in order to access the online threaded discussion forums, students needed to use a computer with a web browser to create, read, and reply to postings, similar to the type of communication required while using eMail. The Computer-Email-Web Fluency Scale will be discussed in more detail in Chapter Three.

As it related to this study, literature regarding whether there is a relationship between students' Computer-Email-Web fluency and their level of participation would be beneficial. However, after an extensive search, no previous studies were located. Several studies were located that related computer literacy to overall academic performance, but they measured pre-existing computer literacy in a class focused on computer literacy, so their relevancy was inappropriate for this study. Clearly, the study reported in this dissertation can provide needed information in the area relating computer fluency to online threaded discussion forums.

Internet Access

As previously mentioned in the discussion of the *Digital Divide*, home computer ownership and Internet access were originally looked at as dichotomous variables. As the concept of the Digital Divide matured, varying degrees of access were identified. Chelus (2003) identified these varying degrees of Internet access as the *Bandwidth Divide*. An issue which made the bandwidth distinction less clear, especially when studying students, was how much of an individual's computer access was at home versus at school. When considering populations other than full-time students, computer access at work or at a public facility such as a library may have also come into play. Instead of looking at Internet access as a "yes" or "no" factor, varying degrees of access could be delineated based upon access speed. The largest distinction was usually made between those with dial-up access through an existing telephone connection (speed ranges of 28Kb to 56Kb) and those with a faster connection.

The data collection instrument for this study sought to identify access speed and whether students had unlimited access to a computer at their residence or if they had to share a computer with others. The purpose of these two questions was to see if limited computer access may hinder a student's ability to participate in threaded discussion forums. In a high school-based study by Alspaugh (1999), in which the number of computers per school was an outcome variable, no relationship was found between the number of students per computer and achievement, attendance, and dropout rates. Schrum (2002) surveyed 14 instructors of college courses offered through a distance education medium. The number one success factor based on mean scores of survey responses was students' access to tools. Schrum found the more difficulty the student experienced in getting to the equipment, the easier it was to find reasons to drop the course. Because the Schrum study dealt with college students in a

distance education environment, students' access to computers may be worth investigating despite the Alspaugh findings.

In reviewing the literature on Internet access (and access speed), mixed results were obtained. Perse and Ferguson (2000) hypothesized that among college students greater Web use would be associated with (a) more readily available computer access, (b) more readily available online access, (c) greater computer expertise, (d) faster Web connection, (e) better technology for handling multimedia, and (f) less mental effort used in Web surfing. In an additional hypothesis Perse and Ferguson postulated that students would have a greater perceived value of Web surfing with the afore mentioned factors. The data used by Perse and Ferguson were collected in the fall of 1997. At that time high-speed connections were scare, so six categories of responses were available with the top connection speed being anything faster than 128Kb. More than half of the respondents did not know their connection speed or left the survey item blank so Perse and Ferguson dropped access speed from further analysis. They did find that the availability of Internet access had a positive correlation with the perceived value of Web surfing, but not with the amount of Web use.

Perse and Ferguson (2000) based their study on the expectation-confirmation model of Oliver (1981). It may be possible to adapt this model to view student satisfaction with online threaded discussion forums which in turn may affect their use of the forums. Oliver's model, as cited in Perse and Ferguson, holds that:

> Satisfaction grows out of a process in which audience members compare their media experience against what they expected from that experience. Expectations, then, serve as benchmarks against which the audience members judge the benefits received from media use. If expectations are met, satisfaction results, and media

> use continues. If expectations are not met, dissatisfaction results, and media use is reduced or discontinued. (p. 344)

If students are not satisfied with online threaded discussion forums, due in part to a slow connection speed which may provide an access hurdle, a possible connection can be made between student's Internet access speed and the student's use of the online threaded discussion forums. Perse and Ferguson's (2000) results, which found that the availability of Internet access had a positive correlation with the perceived value of Web surfing, may support a connection between access speed and online threaded discussion forum use. Several other studies support the positive correlation Perse and Ferguson reported. O'Fathaig (2001) reported that convenience of access to e-learning was an important factor influencing learner satisfaction. Chen and Lin (2002) identified Internet transmission speed and stability as the second-most important factor influencing student success in Web-based learning.

In a study by Schneberger, Amoroso, and Dunfee (2006), the increase in student's computer skills was determined by comparing pre-test and post-test evaluations. Connection speed was an outcome variable and was not found to be significantly correlated to the students' performance; however, Schneberger et al. were using .005 as their alpha level. Wu and Turner (2006) studied bandwidth in relationship to students' use of threaded discussion forums on a system utilizing WebCT Campus Edition. Results from two classes in 2003 indicated that in a class stressing learner-content interaction, there were no statistically significant relationships between bandwidth and (a) number of times students accessed the system, (b) number of postings read, and (c) number of postings made. In the second class, where learner-learner interaction was stressed, a statistically significant relationship was found; students whose computer systems were capable of a high-speed connection read more

postings than those who had only dial-up access; however, students did not make more postings.

The last two years of data (which were 2004 and 2005) in the Wu and Turner (2006) study were gathered with the WebCT Vista Edition which allowed additional data to be collected. In addition to the three variables listed above (number of times students accessed the system, number of postings read, and number of postings made), the Vista Edition allowed three more variables to be collected which were: (d) total elapsed time a student was connected to the system, (e) the number of eMail messages the student sent and (f) the number of eMail messages the student read. The last two years of the study looked only at the class where learner-learner interaction was stressed.

In 2004, Wu and Turner (2006) had found a statistically significant relationship with high-speed access in that (1) students spent more time online, (2) students read more postings, and (3) students made more postings. In the same course, offered in 2005, none of the three relationships from 2004 were found to be statistically significant. However, there was now a relationship with bandwidth and the number of times the student accessed the system. The need to add replication studies is clear due to the mixed results Wu and Turner observed.

Chelus (2003) also studied bandwidth in relation to students' participation in online threaded discussion forums. Specifically, bandwidth was the predictor variable and students' participation score was one outcome variable and course grade was the other outcome variable. The class was a graduate-level course offered as part of a masters program from a university's school of education. Rather than collecting data such as number of times the students accessed the online threaded discussion forum or the number of postings made or

read, the participation score of the student was based on a rubric that contained qualitative as well as quantitative features. Chelus found there was a statistically significant relationship between bandwidth and both participation scores and the students final grade. The students who had high-speed connections scored better on participation score and course grade. The participation score represented approximately one-third of the course grade, and as such was the largest single percentage.

A final note on the studies regarding bandwidth. Perse and Ferguson (2000) collected data in 1997. As previously mentioned, the data were not usable because more than half of the respondents did not know their connection speed or left the survey item blank. Of the six possible choices regarding connection speed, only two were above the 56Kb speed of dial-up. It would appear that Perse and Ferguson (2000) were placing an emphasis on differentiating dial-up speeds as well as between dial-up and high-speed connections. In the Chelus (2003) study, data were collected in 2001. Twenty-eight percent of the students in the Chelus study had high-speed access compared to 72 percent who had dial-up. The Wu and Turner (2006) study represented data from three years, 2003–2005. The percentages of dial-up users were 31, 15, and 18 percent respectively, compared to the percentages of high-speed users which were 69, 85, and 82 percent. Overall, the results indicated that the more recent the study, the higher the percentage of students who had high-speed Internet connections.

One should not conclude, however, that the connection speed issue will disappear. Although a large percentage of in-residence college students have high-speed connections, adult students taking online courses many not have the high-speed luxury that is afforded many residences in a university community. There is also a possibility that some users will lose Internet connections at home as they drop standard telephone connections in favor of

using a cellular phone as their only form of telephony. If employed where high-speed access is readily available at the workplace, adult students who are not in-residence may choose to utilize these high-speed connections at the workplace as opposed to slow access or no access at home. This supports a contention that bandwidth will remain a factor of interest.

CHAPTER III
METHODOLOGY

This chapter begins with a description of explanatory, nonexperimental research then details the researcher's involvement with the subjects and the class studied. A brief discussion of the research model and research questions follows. Next, all variables used in this study are explained. Data collection procedures are then described. The statistical analysis procedures conclude the chapter.

Nonexperimental Research Methods

Kerlinger (1986) defined nonexperimental research as:

> Systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables. (p. 348)

Johnson (n.d.) classified nonexperimental research into the categories of descriptive, predictive, and explanatory. Johnson's determination of whether non-experimental research was explanatory is made by answering to the following questions.

> (1) Where the researchers trying to develop or test a theory about a phenomenon to explain "how" and "why" it operates? (2) Where the researchers trying to explain how the phenomenon operates by identifying the factors that produce change in it? If the answer is yes (and there is no manipulation), then apply the term explanatory nonexperimental research.

This study meets Johnson's (n.d.) classification as explanatory nonexperimental research.

Overview

A single class was selected as the basis of this study for three reasons. First, because this was an introductory inquiry, in-depth observations were required. Second, few classes were available to analyze in which students' participation in class discussion contributed a comparable percentage (30%) of the overall course grade. Third was a limitation of instructors who were willing to restructure their course to allow data collection and non-participant observation.

With three exceptions the researcher's role was that of a non-participant observer, attending all class meetings and the half-day field trip, plus observing all online discussion. The first exception of non-participant observer was that the researcher administered data collection instruments on three occasions as explained in the Data Collection section that follows. The second exception is that, in week 12 of the 15-week semester, the researcher served as class facilitator in the absence of the instructors. The role of class facilitator included introducing two guest presenters then guiding the ensuing class discussion between the students and the guests. The final exception, which was not readily apparent to the students, was that the researcher graded all online discussion participation and provided those scores to the course instructors.

Class Description

Agronomy 450 – *Issues in Sustainable Agriculture*, taught at Iowa State University during the fall semester, 2003 was the class to be studied. This 15-week course met once a week for a total of 30 contact hours. The following course description appeared in the Iowa State University *Courses and Programs Catalog 2003–2005*:

Agron 450. Issues in Sustainable Agriculture.
(Same as Env S 450.) (2-0) Cr. 2. F. Salvador. Agricultural science as a human activity; contemporary agricultural issues from agroecological perspective. Comparative analysis of intended and actual consequences of development of industrial agricultural practices.

This course was first taught in 1989 and has been offered every fall semester since its introduction. Primarily an on-campus offering, several notable distance education scenarios have been utilized. The distance education audiences have included live satellite delivery to a nationwide audience sponsored by ADEC, an multi-university consortium; two-way, audio/visual delivery via the Iowa Communications Network (ICN) to remote locations originating from campus in conjunction with a traditional (face-to-face) class; and videotaped delivery. From its inception through the time of this study (2003), Agronomy 450 was not required by any major but met an environmental issues course requirement within the College of Agriculture. It had gained the status as a popular course and was usually filled to capacity (approximately 60 students) before class pre-registration was completed the previous (spring) semester.

Agronomy 450 – *Issues in Sustainable Agriculture* is a topics-based course, making discussion an ideal method of instruction. A primary purpose of Agronomy 450, as conveyed by the course creator Dr. Ricardo J. Salvador, was to expose students to the practices and ideas of sustainable agriculture so students could share the vision acquired through the course with others after graduation. The syllabus for the fall 2003 Agronomy 450 class and other class artifacts are located in Appendix B. Students enrolled in the Agricultural Studies (formerly Farm Operations) and Agricultural Education curricula are among those to whom the course is targeted. The course syllabus explains that the students' participation in

discussion comprised 30% of the course grade. Students' weekly class attendance also comprised 30% of the course grade and the remaining 40% percent came from a group presentation in the form of a debate (20%) and from a paper (20%) due at the end of the semester which was based upon the students' chosen *area of expertise*.

Research Design

The following four primary research questions were analyzed in this study. An additional analysis of two questions will be introduced in Chapter 4 after the results of the primary research questions are discussed.

Research Question One

> *What amount of variance in students' in-class discussion participation is explained by their apprehension of class participation?*

The predictor variable for this question was the students' Class Apprehension Participation Scale (CAPS) score and the outcome variable was the students' In-Class Discussion Participation (ICDP) rating. The expected result was that there would be a statistically significant relationship between the CAPS score and the ICDP rating. A correlation between the students' score on the CAPS instrument and the rating of their in-class discussion participation was used to determine the relationship.

Research Question Two

> *What amount of students' online threaded discussion participation is explained by the combination of computer-mediated communication apprehension, information technology fluency, and access to the online threaded discussion forum?*

The predictor variables for this question were the students' Computer-Mediated Communication Apprehension (CMCA) Scale score, Computer-Email-Web (CEW) Fluency Scale score, and the Internet Access Indicator (IAI) value. The outcome variable was the students' Online Threaded Discussion Participation (OTDP) score. The expected result was that the CMCA Scale score, CEW Fluency Scale score, and IAI value would be a statistically significant predictor of the amount of students' online threaded discussion participation. A linear regression model was used to determine the relationship.

Research Question Three

> *Does the addition of students' apprehension of class participation to the existing predictor variables in research question two provide any additional explanation of students' online threaded discussion participation?*

The additional predictor variable Class Apprehension Participation Scale (CAPS) score was added to the existing predictor variables (CMCA, CEW Fluency, and IAI) used in research question two. The outcome variable remained the students' Online Threaded Discussion Participation (OTDP) score. The expected result was that the additional explanation (if any) of students' online threaded discussion participation due to students' apprehension about class participation would not be statistically significant. If the expected result was obtained, the CAPS score variable would be independent of the CMCA, CEW Fluency, and Internet access variables. This independence would validate the integrity of the research model by establishing that the predictor variables in research questions one and two were measuring different student characteristics. To determine the relationship the CAPS score was added as an additional step to the linear regression model used in research question two.

Research Question Four

What relationship exists between students' online threaded discussion participation and their in-class discussion participation?

Students' In-Class Discussion Participation (ICDP) rating and students' Online Threaded Discussion Participation (OTDP) score were correlated. The expected result was that there would not be a statistically significant relationship between the two types of student discussion participation. If no relationship was found, the two measures of student discussion participation would be independent. This independence would validate the integrity of the research model by establishing that the two outcome variables in the research model were measuring different student outcomes.

Research Model

Figure 6, *Research model for factors affecting college students' discussion participation*, is a duplicate of Figure 2 and is a visual summary of the relationships among the four research questions in the overall research design. The bold boxes on the left-hand side of the model represent the predictor variables, while the bold boxes on the right-hand side of the model represent the outcome variables. The research questions are shown as non-bold boxes between the predictor and outcome variables. The lines represent the relationships between the predictor variables and the outcome variables that were determined by statistical correlation or regression processes.

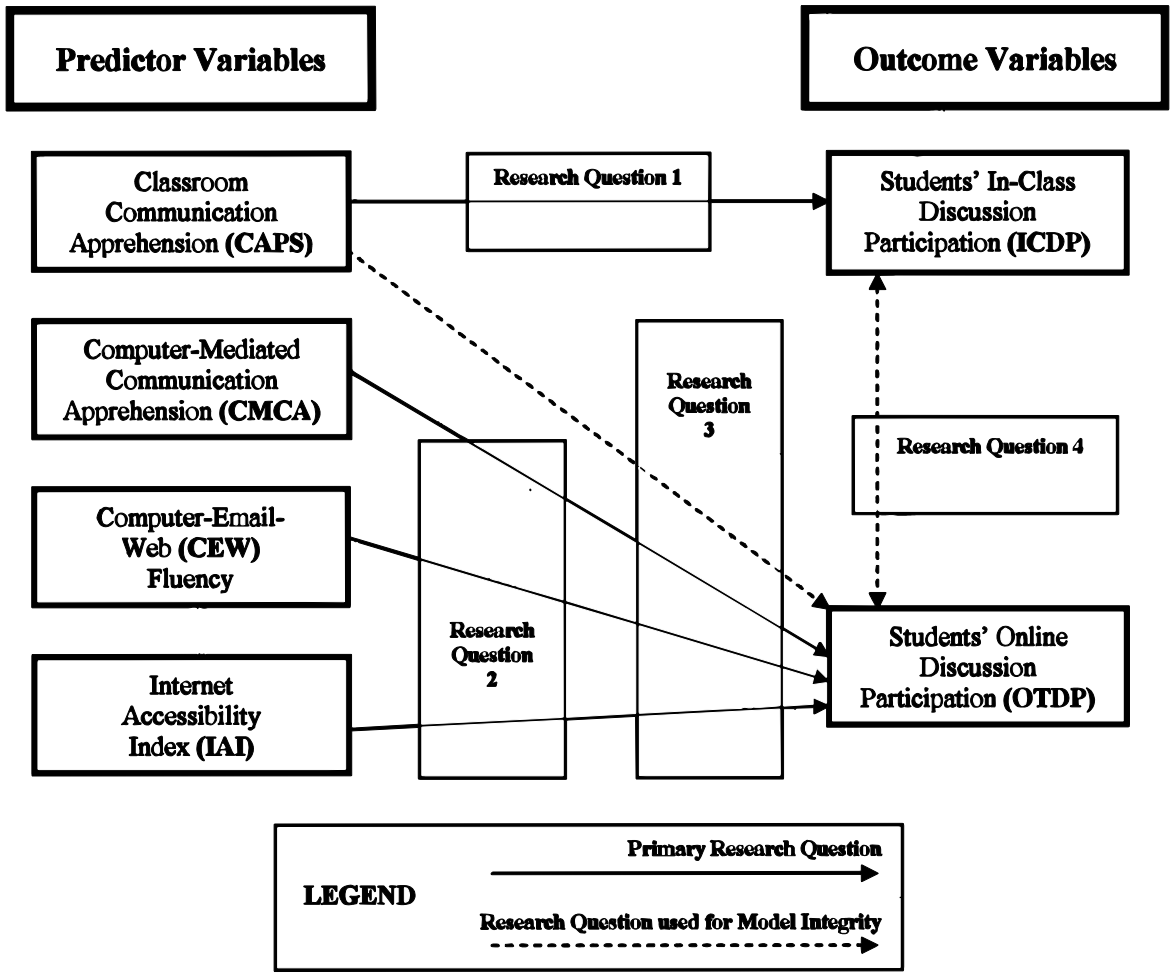

Figure 6. Research model for factors affecting college students' discussion participation.

Variables

This section includes detailed information about the variables used in this study and discusses, when applicable, the instruments that were used to collect the data. Copies of the instruments used are located in Appendix A.

Class Apprehension Participation Scale (CAPS)

The Class Apprehension Participation Scale (CAPS) instrument was used to determine the level of a student's apprehension to participation in the classroom (Neer, 1987). The

Likert-type scale containing 20 questions was constructed with two dimensions. The ten even-numbered (i.e., 2, 4, 6, etc.) communication participation items were designed to measure predisposition to communicate during class participation. The ten odd-numbered (i.e., 1, 3, 5, etc.) communication confidence items were designed to measure both general nervousness and the fear of being evaluated by others during class participation. A reliability check by Neer indicated that the overall CAPS instrument provided an internally consistent measure of classroom apprehension (alpha = .94). The validity of the CAPS instrument was established by its correlation (r = .78) with McCroskey's (1981) PRCA-24.

An example question from the CAPS instrument is: "If I have a question I want answered, I usually wait for someone else to ask it in class." The Likert-type scale choices were strongly agree (assigned 5 points) to strongly disagree (assigned 1 point), therefore higher scores indicated higher levels of apprehension. Five questions (numbered 6, 9, 12, 15, and 18) were written in the opposite perspective were recoded prior to analysis.

Computer-Mediated Communication Apprehension (CMCA)

The Computer-Mediated Communication Apprehension Scale (CMCA) instrument uses a Likert-type scale containing 20 questions and was constructed with three dimensions (Clarke, 1991). The three dimensions of the CMCA Scale are confidence, interest, and privacy concerns. A reliability check by Clarke indicated that the CMCA Scale provided an internally consistent measure of computer-mediated communication apprehension (alpha = .96). The validity of the CMCA Scale was established by its correlation with communication apprehension (r = .32) (McCroskey, 1982), computer experience (r = -.48) (Howard, 1984), fear of negative evaluation (r = .24) (Leary, 1983), writing apprehension (r = .30) (Daly &

Miller, 1975), computer anxiety (r = .68) (Gressard and Loyd, 1986), and computer confidence (r = -.67) (Gressard and Loyd, 1986). All correlations were statistically significant ($p < .001$).

An example question from the CMCA Scale instrument is: "I feel excited and enthusiastic thinking about using a computer to communicate with others." This question is written in a positive perspective and the Likert-type scale choices were strongly agree (assigned one point) to strongly disagree (assigned five points). Ten questions (numbered 5, 9, 10, 11, 12, 15, 16, 17, 18, and 21) were written in the negative perspective and were recoded prior to analysis.

As with the CAPS instrument, higher scores on the CMCA Scale instrument indicated higher levels of apprehension. Clarke (1991) originally included 21 questions in the instrument, but question number 8 was dropped by Clarke after a reliability analysis. To provide consistency with Clarke's original instrument, the questions in the 20-item data collection instrument used in this study are numbered 1–7 and 9–21, with no item number 8.

Computer-Email-Web (CEW) Fluency Scale

The Computer-Email-Web (CEW) Fluency Scale (Bunz, 2002) was used to measure students' aptitude in four areas; web navigation, web editing, basic computer skills, and basic eMail skills. A reliability check by Bunz indicated that the CEW Fluency Scale instrument provided an internally consistent measure of fluency relating to the use of computers, eMail, and the World Wide Web (alpha = .89). The validity of the CEW Fluency instrument was established by the principle component varimax rotation factor analysis. From Bunz's original scale, 31 items were deleted for the final version of the scale (used in this study) due

to double loading two- or three- item factors. The four-factor solution (basic computer skills, basic eMail skills, web navigation, and web editing) accounted for more than 67% of the total variance.

An example question from the CEW Fluency Scale instrument is: "For me, printing a document on a specified printer other than the default printer would require …" The Likert-type scale choice "a great deal of thought" was assigned one point and the choice "no thought" was assigned five points. Therefore, higher scores on the CEW Fluency Scale indicated higher levels of fluency.

Internet Accessibility Index (IAI)

Questions were developed to establish the level of access to online computing facilities that students had at their place of residence, excluding the time the students spent on-campus during the day before, between, and after classes. The purpose of these questions was to determine if students with more restricted access to online computing in their place of residence, both physical access as well as connection speed, were less likely to participate in the online threaded discussion forum.

Several computing professionals within the university community were consulted to determine what type of information needed to be collected in order to ascertain a meaningful level of student access to the online threaded discussion forum. The resulting nine questions, numbers 16–25, appear on the Agronomy 450 Initial Research Questionnaire and were used to determine four categories of access. The four categories were *high-speed single user access*, *high-speed multi-user access*, *dial-up access*, and *no access*. The four categories were collapsed into two which were then recoded as a dummy variable for the linear regressions

used to analyze research questions two and three. Single and multi-user high-speed access were recoded as a *1* and dial-up access and no access were recoded as a *0*. These categories and resulting values are shown in Table 4, IAI categories and values.

Table 4. *IAI categories and values.*

Original Categories	Recoded Categories (dummy variable)	Value
high-speed single user access high-speed multi-user access	single and multi-user high-speed access	1
dial-up access no access	dial-up access and no access	0

An example question used to determine the IAI is: "If you only have a standard dial-up connection, do you limit your computer time online so you don't tie up the phone line? __ Yes __ No __ Not Applicable." This question intended to ascertain whether students attempted to keep a telephone line used for dial-up access relatively free for incoming calls. Doing so could have restricted their participation in the online threaded discussion forum.

In-Class Discussion Participation (ICDP) Rating

Prior to the start of the fall 2003 semester, the researcher met with the two instructors of the Agronomy 450 class to determine an in-class discussion participation rubric. The discussion of rubrics focused on instruments summarized in Appendix D. After considerable deliberation, the instructors chose to implement a system similar to Smith's (1992) which was based on students' self-report of discussion participation. A key aspect of the self-report system, based upon Smith's recommendation, would be the Agronomy 450 instructors' (and

researcher's) validation of the students' self-reported weekly discussion participation score. Students were allowed a maximum of one-half (½) point per day for their in-class discussion participation and they were asked to report what question(s) or point(s) they raised during the class period. Students were reminded that housekeeping questions such as "When is the field trip?" or "Which day does the online grading period end?" were not valid items to be counted as discussion participation.

The student' self-report rubric was expanded by the instructors to include more than participation in class discussion. The additional portion of the self-report required that the students summarize at least two main points of the day's class. This summary of key points, worth one point per week, counted in the calculation of the students' final grade for the course but was not used as part of this research study. Along with other course artifacts, Appendix B contains the self-report form the students filled out regarding their daily in-class participation.

After the first 4 weeks of class, a determination was made by the researcher that the self-report system for measuring in-class discussion participation was not yielding valid data. Upon closely monitoring and recording an entire class period it was observed that some students were over-stating their actual contributions. Some students claimed ownership of questions that had been asked during class but had not been asked by them. For example, during a discussion of the advantages of sustainable farming practices, one student addressed the topic of economics and cited input cost and margins during the discussion. On the self-report forms turned in at the end of the class period, seven students claimed that they had made a discussion comment relating to economics. Only *one* discussion comment relating to economics had occurred in class that day. In another, isolated case, a student self-reported

having raised a discussion topic which no student ever raised. In that instance, when the self-report slip was handed back to the student the following class period, it contained the comment from the instructor "I don't recall you raising that point." Further monitoring of the student did not reveal any additional discrepancies between their actual and reported participation in class discussion. A second issue concerning data validity was that some students self-reported discussion participation contributions prefaced with the comment "I *wanted* to ask about…"

The instructors and researcher then considered using an in-class discussion scoring rubric by Boniecki and Moore (2003), summarized in Appendix D, as a way to obtain data with higher validity. In Boniecki and Moore's *Token Economy* system, the instructor manually awarded participation points (via tokens) during discussion and the tokens were redeemed at the end of the class period in exchange for participation points. The Agronomy 450 instructors rejected adoption of the *Token Economy* system because of three concerns. First, they thought it would introduce too great a change in the administration of the class. Second, they thought it would upset the grading rubric used for the overall course grade. Their final concern related to the possibility that process of awarding tokens may disrupt the ongoing discussion process.

Next, the instructors and the researcher attempted to resolve the validity of the student' discussion participation by providing a higher level of scrutiny when evaluating the self-reports. However, after several more weeks, data validity issues remained including the continued reporting of housekeeping questions that did not represent discussion participation. Further, as the course moved to the point in the semester where group presentations (debates) were made, students were now self-reporting their portion of the group presentation as in-

class discussion participation. To alleviate these on-going data validity issues, the two instructors and the researcher devised a system whereby they would rank each student into one of five participation categories, ranging from low (assigned a rating of 1) to high (assigned a rating of 5). The instructors' and the researcher's placement of students into these discussion participation category ranks would be based on their semester-long observations. The determination of the students' ranking would aided by the students' self-reports of class participation that continued to be submitted at the end of every class session throughout the remainder of the semester.

Online Threaded Discussion Participation (OTDP) Score

Determining a valid measurement of students' contributions to the online threaded discussion forum was not as difficult as the process of determining the rating for students' in-class discussion participation. Two hurdles in obtaining in-class discussion scores were the recording issues and remaining non-obtrusive. Neither of these hurdles existed in obtaining scores for the students' online threaded discussion participation. Recording was not an issue because a permanent record of the online discussion was available for all class members to see and the entire online discussion could be saved and printed. Remaining non-obtrusive was not an issue because, due to the nature of WebCT (the electronic courseware package which facilitated the online discussion), students could not track who had looked at their postings. Also, the nature of an online threaded discussion forum implied that students had no expectation of privacy.

The only remaining issue involved the development of a rubric to determine scores for the students' postings. The various in-class discussion scoring rubrics summarized in

Appendix D seemed adaptable to an online environment. A rudimentary rubric was developed to determine students' online discussion participation score because the Agronomy 450 instructors wished to maintain equity between in-class discussion participation scores and the online discussion participation scoring method. The rubric which was developed was deemed fair to the students by the instructors and acceptable for data analysis purposes by the researcher.

The resulting rubric for scoring students' participation in the online threaded discussion forum had three levels at one-half (½) point intervals. At the first level, one-half (½) point was assigned to a posting that agreed or disagreed with a previous posting but did not introduce a new idea. At the second level, one (1) point was awarded to a posting that brought up a new idea. One (1) point was also awarded to a posting that made an agreement or disagreement with an existing posting and brought up a new idea. At the third level, one and one-half (1 ½) points were awarded to a posting that brought up two or more new ideas. Example postings at each of the three levels follow.

Example posting worth one (1) point:

> Message no. 254
> Posted by [*Student A*] on Wednesday, October 29, 2003 7:50pm
> Subject: Management
> I feel that the biggest factor involving these types of systems is the manager. I think that this is the most important factor involved. I think that both confinement and traditional systems can be economical and sustainable if they are managed right. This is a topic I wanted to pose in class the other day.

Example posting worth one-half (½) point:

> *Note: This message is a branch from the proceeding message.*

Message no. 327 [*Branch from no. 254*]
Posted by [*Student B*] on Monday, November 3, 2003 11:02pm
Subject: Re: Management
I agree that management plays a big factor in how successful one is in farming or any other operation for that matter. If you have good management skills things will work with your farming operation, but if you don't know what you are doing so much, things will be a lot tougher on you and your farm.

Example posting worth one and one-half (1 ½) points:

Message no. 296 [Branch from no. 290]
Posted by [*Student C*] on Monday, November 3, 2003 10:51am
Subject: Re: Money
Expanding the world's food production does not have to occur at the same rate as the population grows. We produce enough to feed the world. The biggest problem with hungry people and population growth is the distribution of wealth and the lack of distribution of food. People who can't afford food go hungry. If you live in a place in the world that doesn't produce a lot of food a big problem and cost is getting the food there. The United States produces a lot of food but it costs a lot. Our standard of living is really high compared to some undeveloped countries. These people in these undeveloped countries can't afford to get the food from us.

Online postings were not graded every week but instead were graded at three five-week intervals. When determining students' course grade their points for participation in the online threaded discussion forum were capped at 4 points per grading period resulting in a total of 12 points for the semester. In collection of the research data, however, all of the contributions to the online threaded discussion forum were used in determining the students' Online Threaded Discussion Participation (OTDP) score. The researcher and two instructors triangulated samples of the student postings to determine the reliability of the researcher's

ratings of the posting data which would make up the students' (OTDP) score. There was agreement on 28 of the 30 (93.3%) samples viewed.

Data Collection

Data for this study were collected in accordance with legal and institutional standards using the instruments and surveys described in this study. This section includes a discussion of the researcher's conformance with the university's Institutional Review Board and the data collection procedures.

Institutional Review Board

As a result of the initial application form for human subjects research, this research project was declared except from Federal regulations as described in 45 CFR 46.101(b)(2). The researcher completed the training required for the protection of human subjects in research on September 23, 2003. Permission to use all data gathering instruments was received on the following dates: September 30, 2003; October 28, 2003; December 2, 2003. The IRB approvals are included in Appendix C.

Data Gathering Procedures

The first data collection occurred on Tuesday, October 7, 2003. At the beginning of the class period, the researcher was introduced by a course instructor. The researcher then read a summarized version of the non-disclosure statement (Appendix C). The students were next given the Class Apprehension Participation Scale (CAPS) instrument (Appendix A) and the Agronomy 450 Initial Research Questionnaire (Appendix A), plus brief verbal instructions for completing them. To ensure that only the researcher knew the students' identity, a slip of

paper with a space for the student's name was stapled to the front of each instrument and survey. A small code number was marked on both the back of the name slip and on the back of the survey, pairing them. Prior to returning the completed instrument and survey, the students detached the name slips and submitted them separately. Approximately 15 minutes were allowed for completion of the CAPS instrument and the survey. All students who chose to participate finished in this time period and no instruments or surveys were incomplete. On October 7, 2003, data collection period number one, 56 of the 62 students who completed the course (90%) chose to participate by returning the CAPS instrument and the Agronomy 450 Initial Research Questionnaire.

A similar procedure was used for data collection periods two and three. Data collections occurred at the beginning of the class periods. The students were first read a summarized version of the non-disclosure statement and were then given the instruments or survey and brief verbal instructions for filling them out. The same method of pairing surveys and name slips previously described was used to protect the students' identity.

Data collection two occurred on November 4, 2003, and consisted of the Computer-Mediated Communication Apprehension (CMCA) Scale and the Computer-Email-Web (CEW) Fluency Scale instruments (Appendix A). Approximately 20 minutes were allowed for completion. Of the students who choose to participate, all but one completed the instruments in the 20 minute time period and that student turned in their instruments at the break, halfway through the two-hour class period. No instruments were incomplete. On November 4, 2003, 55 of the 62 students who completed the course (89%) chose to participate by returning the CMCA Scale and the CEW Fluency Scale instruments.

The third data collection period occurred on December 9, 2003, which was the last class of the semester. This data collection consisted of the Agronomy 450 Final Research Questionnaire (Appendix A). Approximately ten minutes were allowed for the completion of this survey. All students who choose to participate completed the survey in this time period, and no surveys were incomplete. On December 9, 2003, 56 of the 62 students who completed the course (90%) chose to participate by returning the Agronomy 450 Final Research Questionnaire. Prior permission was granted by the respective authors of the CAPS, CMCA Scale, and CEW Fluency Scale instruments either by telephone or eMail.

Statistical Analysis Procedures

All statistical analysis was performed with *SPSS for Windows, Version 15.0.1* (SPSS Inc., 2007). An alpha level of .05 was used unless otherwise noted.

Research Question One

The statistical procedure for research question one was performed using a bi-variate correlation between CAPS and ICDP with a two-tailed test of significance. Cases were excluded pairwise. The SPSS syntax follows.

```
CORRELATIONS
  /VARIABLES=caps icdp
  /PRINT=TWOTAIL NOSIG
  /STATISTICS DESCRIPTIVES
  /MISSING=PAIRWISE .
NONPAR CORR
  /VARIABLES=caps icdp
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE .
```

Research Question Two

The statistical procedure for research question two was preformed using a linear regression. The outcome variable was OLDP. Grade-point average (GPA) was used as a control and was added in block one using the ENTER method. CMCA, CEW, and IAI were added in block two using the ENTER method. The R^2 change and model fit statistics were requested along with regression descriptives, coefficients, and colinearity diagnostics. Cases were excluded pairwise. The SPSS syntax follows.

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT icdp
  /METHOD=ENTER gpa  /METHOD=ENTER cmca cew iai
  /CASEWISE PLOT(ZRESID) OUTLIERS(3) .
```

Research Question Three

The statistical procedure for research question three was identical to that used in research question two except that CAPS was added to the regression in block three using the ENTER method. The SPSS syntax follows.

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
```

```
/DEPENDENT icdp
/METHOD=ENTER gpa  /METHOD=ENTER cmca cew iai
/METHOD=ENTER caps
/CASEWISE PLOT(ZRESID) OUTLIERS(3) .
```

Research Question Four

The statistical procedure for research question four was identical to that used in research question one except the two variables analyzed were OLDP and ICDP. The SPSS syntax follows.

```
CORRELATIONS
  /VARIABLES=oldp icdp
  /PRINT=TWOTAIL NOSIG
  /STATISTICS DESCRIPTIVES
  /MISSING=PAIRWISE .
NONPAR CORR
  /VARIABLES= caps icdp
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE .
```

The results of the statistical procedures related to the four research questions and the two additional analyses are presented and discussed in detail in Chapter 4.

CHAPTER IV
RESULTS AND DISCUSSION

This chapter presents the results of the statistical analyses described in Chapter 3 and discusses those findings. The research model and research questions are presented first, then major findings are summarized and the characteristics of the participants are reported. Each research question is then presented individually followed by the descriptive statistics of the variables used to determine the research question result. If the variable was derived from a scale internal consistency and reliability are reported. Next, the results of the statistical tests used to analyze the data are reported followed by the discussion of the entire research model. Additional data analyses and a discussion of those findings conclude the chapter.

Research Design Review

The purpose of this study was to determine relationships between specific factors affecting college students' participation in class discussions, both in-class and through an online threaded discussion forum. The predictor variables identified as factors were: apprehension of class participation, apprehension of computer-mediated communication, degree of information technology fluency, and Internet access (which provides a gateway to the online threaded discussion forum). The outcome variables were the amount of classroom discussion participation and the amount on online threaded discussion participation exhibited by the students.

Research Question One

What amount of variance in students' in-class discussion participation is explained by their apprehension of class participation?

Research Question Two

What amount of students' online threaded discussion participation is explained by the combination of computer-mediated communication apprehension, information technology fluency, and students' access to online threaded discussion forums?

Research Question Three

Does the addition of students' apprehension of class participation to the existing predictor variables in research question two provide any additional explanation of students' online threaded discussion participation?

Research Question Four

What relationship exists between students' online threaded discussion participation and their in-class discussion participation?

Research Model

Figure 7 is a duplicate of Figures 2 and 6 and is a visual summary of the relationships among the four research questions in the overall research design. The bold boxes on the left-hand side of the model represent the predictor variables, while the bold boxes on the right-hand side of the model represent the outcome variables. The research questions are shown as non-bold boxes between the predictor and outcome variables. The lines represent the relationships between the predictor variables and the outcome variables that were determined by statistical correlation or regression processes.

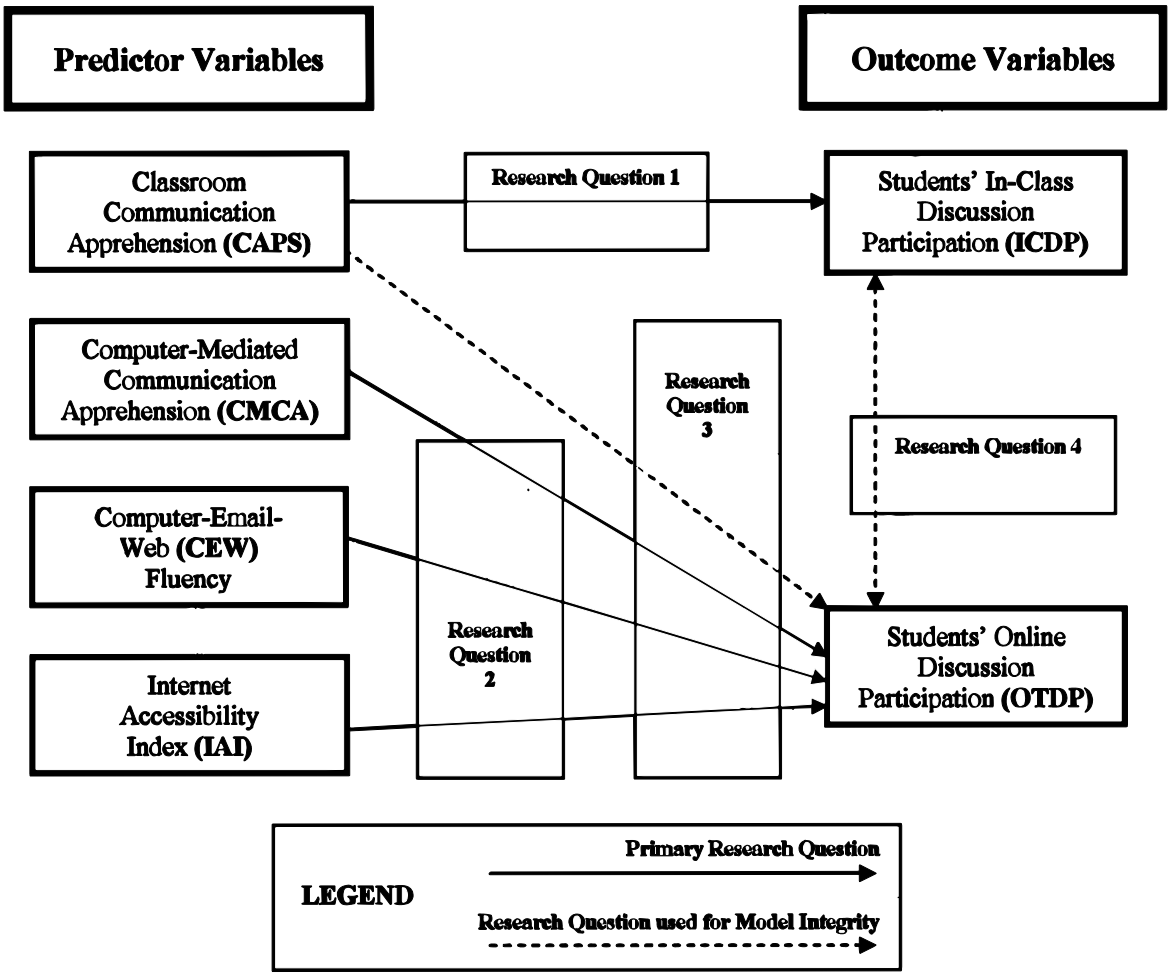

Figure 7. Research model for factors affecting college students' discussion participation.

Major Findings

Analyses of the data collected in this study revealed a *moderate* (Franzblau, 1958) negative relationship (r = -.60) between the degree of classroom apprehension and the amount of classroom discussion participation the students exhibited. This result was expected. A preliminary analysis revealed a moderate positive relationship (r = .46) between students' online threaded discussion participation score and their cumulative grade-point average (GPA) which indicated that more apprehensive students participated less in the class discussion. After controlling for GPA the three variables of students' computer-mediated

communication apprehension, information technological fluency, and Internet access were not statistically significant predictors of the amount of online threaded discussion participation the students exhibited (R^2 = .045). This result was not expected. Two additional research questions were asked to verify the integrity of the research model which was found to be valid. An additional analysis indicated that gender issues had not confounded the research model. Also, additional analysis did not support a possible conclusion that high-CCA (classroom communication apprehensive) students participated more in the online threaded discussion forum more than their low- or non- CCA peers.

The Participants

This section presents the demographics of the study population, information about the students' employment and grade point, and their prior knowledge of the course material.

Demographics

Students enrolled in Agronomy 450 – *Issues in Sustainable Agriculture*, during the fall 2003 semester had the following characteristics. The total number of students at the beginning of the semester was 65, and at the end of the semester 62 (N = 62) remained (95%). Of the remaining students, 40 (65%) were male and 22 (35%) were female. The average age was 21.5, (SD = 1.0) in a range of 20–25 for the 55 students who reported their age. During the fall 2003 semester, two students (3%) were classified as sophomores, 25 (40%) were juniors, and 35 (56%) were seniors. Of the 35 seniors, 11 (31%) graduated at the end of the fall 2003 semester, which represented 18% of the total class.

Nine majors were represented and all but four (6%) of the students were classified in the College of Agriculture. The 17 students (27%) who were majoring in Agricultural Studies

(the former Farm Operations curriculum) comprised the largest group, followed by 15 students (24%) who were majoring in Animal Science; two students (3%) classified as Dairy Science majors were included in the Animal Science count because Dairy Science is a curriculum within the Animal Science department. Eleven students (18%) were majoring in Agronomy, nine (15%) in Agricultural Education, three (5%) in Agricultural Business, and two (3%) in Agricultural Systems Technology. Of the four students whose majors were not in the College of Agriculture, one each majored in Animal Ecology and Biology, and two majored in Anthropology. Fifty-four (87%) of the students were from Iowa.

Forty-four (79%) of the 56 students who responded to the question "Do you have a job?" reported that they did. The average hours per week those students worked was 14.4 (*SD* = 11.2) in a range of five to 50 hours per week. Students were asked to provide their approximate cumulative grade point average on the Agronomy 450 Final Research Questionnaire (Appendix B) and 54 (87%) students responded. The average grade point on a 4.0 scale was 2.96 (*SD* = .51) in a range of 2.0 to 3.99.

Prior Knowledge

Three questions relating to the students' prior knowledge were asked on Agronomy 450 Initial Research Questionnaire.

> *What was your agricultural background prior to starting college?*
>
> *What was your previous knowledge of sustainable agriculture prior to the start of this class?* Please include personal experience and knowledge from other college courses when making your decision.

What was your previous knowledge of environmental concerns prior to the start of this class? Please include personal experience and knowledge from other college courses when making your decision.

The possible responses to the three questions were *extensive*, *moderate*, *limited*, and *none*, with 56 (90%) students responding. A summary of students' prior knowledge is presented in Table 5, which follows.

Table 5. *Summary of students' prior knowledge.*

	Extensive	Moderate	Limited	None
Agricultural background prior to college	34 (61%)	14 (25%)	2 (4%)	6 (11%)
Previous knowledge of Sustainable Agriculture	8 (14%)	32 (57%)	15 (27%)	1 (2%)
Previous knowledge of Environmental Concerns	12 (21%)	41 (73%)	3 (5%)	0 (0%)

Research Question One

What amount of variance in students' in-class discussion participation is explained by their apprehension of class participation?

The predictor variable for this question was the students' Class Apprehension Participation Scale (CAPS) score and the outcome variable was the students' In-Class Discussion Participation (ICDP) rating. The expected result was that there would be a statistically significant relationship between the CAPS score and the ICDP rating. A correlation between the students' score on the CAPS instrument and the rating of in-class discussion participation they exhibited was used to determine the relationship.

Class Apprehension participation Scale (CAPS) Instrument

The Class Apprehension Participation Scale (CAPS) instrument (Neer, 1987) is an contains 20 questions and uses a Likert-type scale; responses range from 1 (strongly disagree) to5 (strongly agree). The CAPS instrument is worded to indicate the higher the score the higher the level of apprehension. The CAPS instrument was used to determine the level of a student's apprehension to participation in the classroom. Fifty-six students (90%) completed the CAPS instrument ($N = 56$). Based on mean item scores, the low was 1.35 and the high was 4.5 ($M = 3.06$, $SD = .69$) in a range of 1 to 5. The internal consistency of the scale was assessed and the value of Cronbach's alpha was .90; an alpha of .94 was reported by Neer.

In-Class Discussion Participation Rating

The students' in-class discussion participation rating (ICDP) consisted of five categories, from low (assigned a rating of one) to high (assigned a rating of five), reflecting the amount of in-class discussion participation exhibited by the students. All 62 students ($N = 62$) who completed the course were ranked ($M = 2.73$, $SD = 1.43$).

Analysis of Correlation

A correlation analysis, using Spearman's *rho* as the model, was conducted between the students' CAPS score and the students' ICDP rating. The analysis revealed a statistically significant negative relationship ($r = -.60$, $N = 56$), with the value of R^2 being .36. The two-tailed test of significance produced a probability of less than of .001. This analysis indicated that 36% of the variance in students' in-class discussion participation rating could be explained by the variation in their apprehension of class participation. The expected result

was that there would be a statistically significant relationship between the CAPS score and the ICDP rating therefore research question number one is supported by this finding.

Research Question Two

What amount of students' online threaded discussion participation is explained by the combination of computer-mediated communication apprehension, information technology fluency, and students' access to the online threaded discussion forum?

The predictor variables for this question were the students' Computer-Mediated Communication Apprehension (CMCA) Scale instrument score, the Computer-Email-Web (CEW) Fluency Scale score, and the Internet Access Indicator (IAI) value. The outcome variable was the students' Online Threaded Discussion Participation (OTDP) score. The expected result was that the CMCA Scale score, CEW Fluency Scale score, and IAI value would be statistically significant predictors of the amount of students' online threaded discussion participation. A linear regression model was used to determine the relationship.

Computer-Mediated Communication Apprehension (CMCA) Scale Instrument

The Computer-Mediated Communication Apprehension (CMCA) Scale instrument (Clarke, 1991) contains 20 questions and uses a Likert-type scale with responses ranging from 1 (strongly agree) to 5 (strongly disagree). The CMCA Scale instrument is worded to indicate the higher the score the higher the level of apprehension and was used to determine the level of a student's apprehension to participation in the online threaded discussion forum. Fifty-five students (89%) completed the CMCA Scale instrument ($N = 55$). Based on mean item scores the low was 1.25 and the high was 3.45 ($M = 2.15$, $SD = .50$) in a range of 1 to 5.

The internal consistency of the scale was assessed and the value of Cronbach's alpha was .88; an alpha of .96 was reported by Clarke.

Computer-Email-Web (CEW) Fluency Scale Instrument

The Computer-Email-Web (CEW) Fluency Scale instrument (Bunz, 2002) contains 52 questions, each describing a particular task dealing with the use of computers, eMail, or the World Wide Web. It used a Likert-type scale and the possible responses ranged from 1 (requiring a great deal of thought) to 5 (requiring no thought). The CEW Fluency Scale instrument is worded to indicate the higher the score the higher the level of fluency and was used to determine students' information technology fluency. Fifty-five students (89%) completed the CEW Fluency Scale instrument ($N = 55$). Based on mean item scores, the low score was 3.26 and the high score was 4.96 ($M = 4.34$, $SD = .41$) in a range of 1 to 5. The internal consistency of the scale was assessed and the value of Cronbach's alpha was .95; an alpha of .89 was reported by Bunz.

Internet Access Indicator

The Internet Access Indicator (IAI) was developed to establish the level of access students had to the online threaded discussion forum at their primary residence. Fifty-six students (90%) completed the survey from which the IAI was derived ($N = 56$). The four original categories were collapsed into two for use in linear regressions. The two (dummy variable) values (see Table 4) were recoded as *0* for dial-up access or no access and *1* for high-speed single-user access or high-speed multi-user access. The mean value for students' Internet access was .21 ($SD = .41$).

Online Threaded Discussion Participation (OTDP) Score

The student's online threaded discussion participation (OTDP) score was the number of points the student had accumulated by the end of the semester through their contributions (postings) to the course's online threaded discussion forum. All 62 students ($N = 62$) who completed the course were ranked ($M = 16.10$, $SD = 11.32$).

Analysis of Linear Regression

A single-step linear regression had been planned to determine the relationship between computer-mediated communication apprehension (CMCA), computer-email-web (CEW) fluency, and the Internet access indicator (IAI) as predictor variables and students' Online Threaded Discussion Participation (OTDP) score as the outcome variable. A preliminary analysis determined that a moderate relationship ($r = .48$) existed between students' cumulative grade-point average (GPA) and their OTDP scores. To control for this relationship, GPA was used as step one in the linear regression, then CMCA, CEW Fluency, and IAI were run as step two. Tables 6 and 7 that follow summarize the results of the regression analysis.

The value of R^2 (.21) shown in step one of Table 7 indicates that 21% of the variance in students' online threaded discussion participation score is associated to the independent variable of GPA. With a probability of .001, this result is statistically significant at the .05 level. The addition of CMCA, CEW Fluency, and the IAI in step two of the regression produced the ΔR^2 value of .05. The additional variance in students' ODTP score had an F change statistic of .46 which was not statistically significant at the .05 level.

Table 6. *Means, standard deviations, and intercorrelations for students' online threaded discussion participation (OTDP) score and predictor variables.*

Variable	*M*	*SD*	*1*	*2*	*3*	*4*
Online Threaded Discussion Score	16.10	11.37	.46**	-.09	-.25*	.05
Predictor Variables						
1. GPA	2.95	.51	- -	-.05	-.30*	-.09
2. CMC Apprehension	2.15	.51		- -	-.38**	.27*
3. CEW Fluency	4.36	.42			- -	-.35
4. Internet Access Indicator	.21	.41				- -

$N = 48$ * $p<.05$. **$p<.01$.

Table 7. *Regression analysis summary for students' online threaded discussion participation (OTDP) score and predictor variables.*

Predictor Variable	*B*	*SEB*	*β*	R^2	ΔR^2
Step 1					
GPA	10.30	2.94	.46	.21**	- -
Step 2					
GPA	9.04	3.16	.40	.26	.05
CMC Apprehension	-.20	.17	-.18	.26	.05
CEW Fluency	-.10	.08	-.19	.26	.05
Internet Access Indicator	3.50	3.80	.13	.26	.05

$N = 48$ * $p<.05$. **$p<.01$.

Research Question Three

Does the addition of students' apprehension of class participation to the existing predictor variables in research question two provide any additional explanation of students' online threaded discussion participation?

The additional predictor variable Class Apprehension Participation Scale (CAPS) score was added to the existing predictor variables (CMCA, CEW Fluency, and IAI) used in research question two. The outcome variable remained the students' Online Threaded Discussion Participation (OTDP) score. The expected result was that the additional explanation (if any) of students' online threaded discussion participation due to students'

apprehension about class participation would not be statistically significant. If the expected result was obtained, the CAPS score variable would be independent of the CMCA, CEW Fluency, and Internet access variables. This independence would validate the integrity of the research model by establishing that the predictor variables in research questions one and two were measuring different student characteristics. To determine the relationship the CAPS score was added as an additional step to the linear regression model used in research question two.

Description of Variables

All variables used in the analysis of research question three have been previously described in the sections titled Research Question One and Research Question Two.

Analysis of Linear Regression

The values in step one and step two of the regression are identical to the values listed in Table 7 and were previously described. The addition of the CAPS score in step three of the regression produced the ΔR^2 value of .02. This additional two percent of the variance in students' OTDP score had an *F* change statistic of .33 which was not statistically significant at the .05 level. Tables 8 and 9, which follow, summarize the results of adding students' CAPS score into the regression analysis as step 3.

Table 8. *Means, standard deviations, and intercorrelations for students' online threaded discussion participation (OTDP) score and predictor variables including CAPS score.*

Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*
Online threaded discussion Score	16.10	11.37	.46**	-.09	-.25*	.05	-.12
Independent Variables							
1. GPA	2.95	.51	- -	-.05	-.30*	-.09	.00
2. CMCA	2.15	.51		- -	-.38**	.27*	-.14
3. CEW Fluency	4.35	.42			- -	-.35	.15
4. Internet Access	.21	.41				- -	-.07
5. CAPS	2.99	.68					- -

$N = 48$ * $p<.05$. **$p<.01$.

Table 9. *Regression analysis summary for students' online threaded discussion participation (OTDP) score and predictor variables including CAPS score.*

Predictor Variable	*B*	*SEB*	*β*	R^2	ΔR^2
Step 1					
GPA	10.30	2.94	.46	.21**	- -
Step 2					
GPA	9.04	3.16	.40	.26	.05
CMC Apprehension	-.20	.17	-.18	.26	.05
CEW Fluency	-.10	.08	-.19	.26	.05
Internet Access Indicator	3.50	3.80	.13	.26	.05
Step 3					
GPA	8.95	3.16	.40	.27	.02
CMC Apprehension	-.19	.17	-.17	.27	.02
CEW Fluency	-.11	.08	-.21	.27	.02
Internet Access Indicator	3.65	3.80	.13	.27	.02
CAPS	-.11	-.11	-.13	.27	.02

$N = 48$ * $p<.05$. **$p<.01$.

Research Question Four

What relationship exists between students' online threaded discussion participation and their in-class discussion participation?

Students' In-Class Discussion Participation (ICDP) rating and students' Online Threaded Discussion Participation (OTDP) score were correlated. The expected result was that there would not be a statistically significant relationship between the two types of student discussion participation. If no relationship was found, the two measures of student discussion participation would be independent. This independence would validate the integrity of the research model by establishing that the two outcome variables in the research model were measuring different student outcomes

Description of Variables

All variables used in the analysis of research question four have been previously described in the sections titled Research Questions One and Research Questions Two.

Analysis of Correlation

A correlation analysis, using Spearman's *rho* as the model, was conducted between student's in-class discussion participation rating, and the student's online threaded discussion participation score. The analysis did not reveal a statistically significant relationship ($r = .136$, $N = 62$), with the value of R^2 being .01. The two-tailed test of significance produced a probability of .29 indicating that no relationship exists. This supports the expected result of research question three that there would not be a statistically significant relationship between the two types of student discussion participation. This result, like the result of research question three, validates the integrity of the overall research model because the variables used in analyzing the in-class discussion participation are independent of the variables used to analyze the online threaded discussion participation.

Research Model with Test Statistic Results

Figure 8, which follows, has included the test statistic results of each research question.

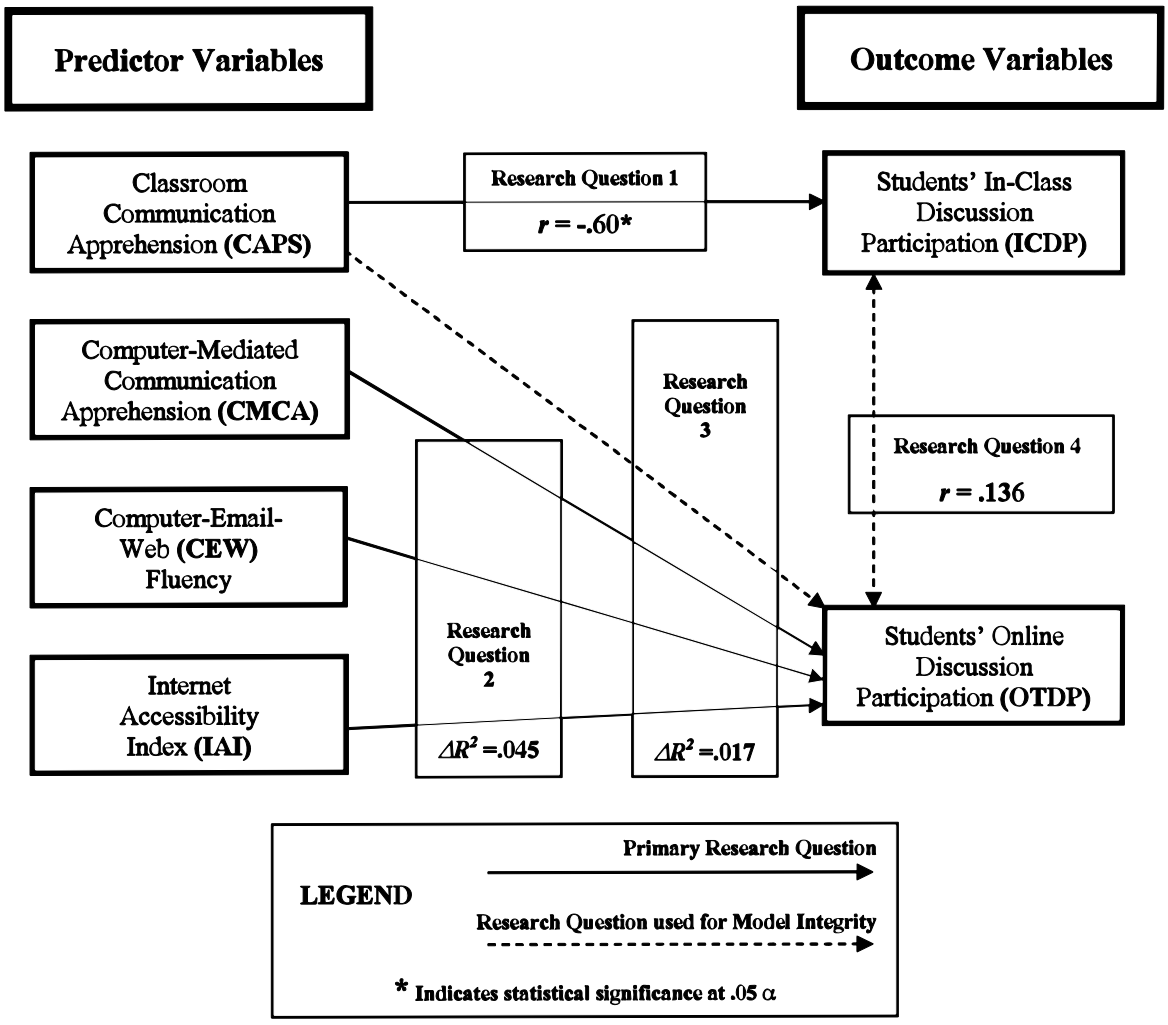

Figure 8. Statistical findings of the research model.

Discussion of Research Questions

The discussion of the research questions is organized according to the variables used in this study, starting with communication apprehension. Information technology fluency follows, and Internet access concludes the section.

Communication Apprehension

In general, evidence supported a conclusion that the more apprehensive a student was of in-class participation, the less classroom discussion participation they exhibited. This result supports Neer's (1987) findings.The evidence relating students' CMC apprehension to their discussion participation in an online threaded discussion forum was inconclusive. The correlation between students' apprehension of computer-mediated communication and the online threaded discussion participation they exhibited, as shown in Table 6, indicated a negative relationship (r = -.09); however, this relationship was not found to be statistically significant. If this relationship were indeed negative it would indicate that, similar to in-class discussion, the more CMC apprehensive the student the less they participated in the online discussion.

One possible explanation in the lack of strength of the relationship between CMCA and online threaded discussion participation was that the CMCA measure was not as accurate in predicting online threaded discussion participation as the CAPS instrument was in predicting in-class discussion participation. CAPS was developed specifically for classroom participation apprehension and was chosen over McCroskey's (1981) PRCA-24 which did not specifically target the classroom environment. Because no measure of CMC

apprehension that was targeted specifically for the classroom could be located, Clarke's (1991) general measure of CMCA was used.

Another possible explanation of the lack of strength in the relationship between the CMCA scale score and the online threaded discussion participation score was, that despite the apprehension level that did exist, students were more willing to overcome their CMC apprehension (to gain online threaded discussion participation points) than they were to overcome their classroom participation apprehension (to gain in-class discussion participation points). If this were the case, is it an indication of the strength of the two apprehension measures? This possibility is discussed further in the Conclusion section of Chapter 5. As reported in Chapter 2, Brown, Fuller, and Vician (2002) conducted a study in which their measure of CMC apprehension (which was not Clarke's (1991) CMCA Scale instrument used in this study) predicted 52% of the variance (R^2) in CMC satisfaction but only 12 percent of the variance (R^2) in use of CMC. A possible interpretation is that apprehensive students participated in the online threaded discussion forum but did so with less satisfaction than their less apprehensive peers.

Information Technology Fluency

The predictor variable measuring information technology fluency showed a statistically significant negative correlation (r = -.25) with student's online threaded discussion participation score in the original data set as shown in Table 6. This correlation indicates that the more fluent the student was in skills required to access the online threaded discussion forum, the less discussion participation they exhibited. This was not the expected result and seems counter-intuitive. This result is in contrast to the findings of Fishman (1997) who

reported a strong relationship between self-reported skills with the CMC tools and the students' actual CMC use.

What possible explanations might describe this phenomenon? As indicated by the distribution statistics ($M = 4.36$, $SD = .42$) the CEW Fluency variable was negatively skewed and the lowest score (3.26) was above the midpoint in the range (of one to five) for the 55 students who completed the CEW Fluency Scale instrument. A response of three on the CEW Fluency Scale instrument corresponded to the Lickert-type description of *some thought*, a response of four corresponded to the description of *a little thought,* and a response of five corresponded to the description of *no thought*. With a mean score of 4.36, a possible ceiling effect is indicated.

Perhaps the minimum fluency needed to participate in the online threaded discussion forum was achieved by all students, regardless of their score on the CEW Fluency Scale instrument. The distribution statistics may support that supposition but the negative relationship whereby the more information technology-fluent the student was the less participation in the online threaded discussion forum they exhibited remains unexplained. Fishman's (1997) subjects were high-school students in the 1994–1995 school year, and the self-report instrument used to measure those students' skills was unavailable in the report. Possibly the variance in Fishman's sample was greater and perhaps the lower level students experienced some difficulties performing the CMC tasks which did not appear to be the case in the study reported here. Another possibility is that less information technology-fluent students viewed the online threaded discussion forum as an interesting challenge and were more motivated to participate.

Internet Access

Based on the correlation statistics in Tables 6 and 8, the Internet access variable (IAI) by itself was not a strong predictor of students' online threaded discussion participation. As reported in Chapter 2, research relating the speed of Internet access to any objective measures of student performance was limited. Wu and Turner (2006) did find that students with high-speed Internet connections *read more* online postings to the online threaded discussion forum, but those students *did not make more* postings to the online threaded discussion forum. Because points toward the course grade were awarded for online threaded discussion contributions in the Wu and Turner study, connection speed may not have been a primary concern of students when choosing whether to participate.

Another consideration may also mediate some student's slow connection speeds. Because all campus-based connections were presumed to be high-speed, some students with slow connection speeds may have utilized high-speed on-campus connections for a portion of the time when they participated in the online discussions. Students who reported a low-speed connection were not asked to provide information regarding the time they spent participating in the online threaded discussion forum using low-speed versus high-speed connections.

As previously stated in the result of research question one, apprehension of class participation explained 36% of the variance in the amount of in-class discussion participation the students exhibited. There remain other factors that may limit students' participation in class discussions. Competition to speak may be a factor for students who are not apprehensive. This competition may come in form of the clock; in situations where the instructors may offer limited time for discussion. Competition between students for the time that is allotted for in-class discussion may also play a role, as does each student's ability to be

recognized by the instructor. This recognition may be due to the students' seating choice or the instructor's judgment of the perceived worth of the student's comment based on previous responses the student has made. Some students, although not apprehensive, may not be able to formulate an answer and then seek instructor recognition before another student had already expressed the same point or opinion.

If competition, recognition, and time to formulate a response contribute to a reduction in students' in-class discussion participation, online threaded discussion solves these problems and allows class time which may have previously been allocated to in-class discussions to be spent on other things. The instructional design benefits of an online threaded discussion forum will be discussed further in the Chapter 5.

Additional Analysis

During analysis of the four research questions in this study, two additional research questions arose and are reported in this additional analysis section. The first additional question analyzes gender and the second analyzes participation in the online threaded discussion forum by students with high-CCA (classroom communication apprehension).

Gender

Chapter 1 reported conflicting results on gender's influence in students' participation. An analysis of research question one, *What amount of variance in students' in-class discussion participation is explained by their apprehension of classroom participation*, indicated that students' gender may be an issue for further consideration.

As reported in Chapter 3, 40 (65%) of the 62 students who completed the course were male and 22 (35%) were female. A correlation analysis, using Spearman's *rho* as the model,

was conducted between student's in-class discussion participation (ICDP) rating and gender. The analysis revealed a statistically significant relationship (r = .35, N = 56), with the value of R^2 being .13. The two-tailed test of significance produced a probability of less than .001. This statistically significant result indicated that 13% of the variance in students' ICDP could be explained by gender.

A second correlation analysis, using Spearman's *rho* as the model, was conducted between students' Class Apprehension Participation Scale (CAPS) score and gender. The analysis did not revealed a statistically significant relationship (r = .06, N = 56), with the value of R^2 being .01. The two-tailed test of significance produced a value of .68. This result, although not statistically significant, indicated that one percent of the variance in students' CAPS score could be explained by gender.

To determine if gender was confounding the research model, the additional question identified with gender became:

> *Are there differences in the result of research question one, which asked "What amount of variance in students' in-class discussion participation is explained by their apprehension of classroom participation?" based on the students' gender?*

The statistical procedure for additional analysis one was identical to the statistical procedure for research question one except the data file was split and run once for gender = male and a second time for gender = female.

Males Only

A correlation analysis, using Spearman's *rho* as the model, was conducted between the male students' CAPS scores and their ICDP ratings. The analysis revealed statistically significant positive relationship (r = .63, N = 56), with the value of R^2 being .40. The two-

tailed test of significance produced a probability of less than .001. This analysis indicated that 40% of the variance in male students' ICPD ratings could be explained by the variation in male students' apprehension of in-class participation.

Females Only

A correlation analysis, using Spearman's *rho* as the model, was conducted between the female students' CAPS scores and their ICDP ratings for the females in the class. The analysis revealed statistically significant positive relationship ($r = .56$, $N = 56$), with the value of R^2 being .32. The two-tailed test of significance produced a p value of .01. This analysis indicated that 32% of the variance in female students' ICDP rating could be explained by the variation in female students' apprehension of in-class participation.

Summary of Gender Analysis

The correlation of student's Class Apprehension Participation Scale (CAPS) score and Classroom Participation Rating produced values of $r = .63$ for males and $r = .56$ for females. A *z*-test for two correlation coefficients (Kanji, 1993, p. 35) was calculated. The calculation resulted in a value of .014, which did not fall within the rejection range of .196, therefore the difference between the two correlations was not significant at the .05 alpha level. This result indicated that male and female students have a similar variance in the amount of in-class discussion participation that is explained by the variation in their apprehension of in-class participation. Therefore, gender was not confounding the research model.

High-CCA Students' Participation in the Online Threaded Discussion Forum

The purpose of this study was to determine relationships between specific factors affecting college students' participation in class discussions, both in-class and through an

online threaded discussion forum. That purpose did not; however, analyze students' preference of which type of discussions (in-class or online) they selected to participate in. A practical question based on the results of the research question one, which found that *36% of the variance in students' in-class discussion participation rating could be explained by the variation in their apprehension of class participation,* is relevant to instructors. The question is: *Would students who are apprehensive of class participation utilize an online threaded discussion forum as an alternative to in-class discussion participation more than their less class participation apprehensive peers?* The reverse question is: *Would students who are apprehensive of computer-mediated communication utilize in-class discussion as an alternative to an online threaded discussion forum more than their less computer-mediated communication apprehensive peers?* The reverse question was not addressed because this study focused on adding an online threaded discussion forum to a face-to-face or online class whereas adding in-class discussion to a face-to-face or online class was not a focus.

The second question for additional analysis became:

> *Do high classroom communication apprehensive (CCA) students participate more in the online threaded discussion forum than their low or non-apprehensive peers?*

Apprehension Classification

Determining an indicator of apprehension level can take two forms. One is the raw score derived from an instrument and the second is a classification based upon those scores. McCroskey (1970, 1976, 1978) proposed and used a classification system of communication apprehension where subjects whose score fell one standard deviation above the mean were classified as high-apprehensives and subjects whose score fell one standard deviation below

the mean were classified as low-apprehensives. Subjects whose score fell within one standard deviation of the mean were classified as non-apprehensives. Neer (1987), creator of the CAPS instrument, also used this type of a classification system. Utilizing this classification system, nine (16%) of the 56 students in this study who completed the CAPS instrument were classified as high classroom communication apprehensives (CCAs). Six students (11%) were classified as low CCAs, and the remaining 41 students (73%) were classified as non CCAs.

High and Low/Non CCA Students' Participation in Online Discussion Forums

The statistical procedure to test the second question for additional analysis: *Do high classroom communication apprehensive (CCA) students participate more in the online threaded discussion forum than their low- or non- apprehensive peers*, was: **Analyze**; **Compare Means**; **Independent-Samples t-Test**; to determine if there was a difference in the means between high-CCA students' online threaded discussion participations scores when compared to students who were not classified as high-CCA. The SPSS syntax was as follows.

```
T-TEST
  GROUPS = cca_oldp(0 1)
  /MISSING = ANALYSIS
  /VARIABLES = oldp
  /CRITERIA = CI(.95) .
```

The result of this analysis is presented in Table 10 which follows.

Table 10. *T-test summary for Students' online threaded discussion participation score between High CCAs compared to Low and Non CCAs.*

	M	*SD*	*N*	*t*
High CCA's OTDP Scores	17.72	12.33	9	-.644
Low & Non CCAs OTDP Scores	14.89	10.58	47	-.716

* $p<.05$ ** $p<.01$

The two-tailed test of significance (equal variances assumed) produced a probability of .447 and was not statistically significant at the .05 alpha level. The discussion of high CCA students' participation in an online threaded discussion forum continues in Chapter 5.

CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter begins with a summary of the research results followed by conclusions based upon the findings. Implications, based upon the conclusions, are formulated as recommendations to the profession for the use of an online threaded discussion forum as a supplement to a face-to-face or online course. Finally, recommendations are made for future research analyzing student participation in an online threaded discussion forum.

Summary

The purpose of this explanatory, non-experimental research study was to determine relationships between factors affecting college students' participation in class discussions, both in-class discussion and through an online threaded discussion forum. The factors studied are communication apprehension (CA), information technology fluency, and Internet access.

This study found a statistically significant relationship between classroom apprehension and the amount of classroom discussion participation students exhibited. This result was expected. After controlling for GPA the three variables of students' computer-mediated communication apprehension, information technology fluency, and Internet access were not statistically significant predictors of the amount of online threaded discussion participation students exhibited. This result was not expected. An additional analysis indicated that gender issues had not confounded the research model. Additional analysis did not support the contention that high-CCA (classroom communication apprehensive) students participated more in an online threaded discussion forum than their low- or non- apprehensive peers.

Class Description

Agronomy 450 – *Issues in Sustainable Agriculture* was an issue-based class utilizing the discussion teaching method where, according to the course creator, attitude change was one of the desired outcomes. The class represented a diverse sample of students within the College of Agriculture; diverse in respect to majors and diverse in previous knowledge of agriculture, sustainable agriculture, and environmental issues. Although Agronomy 450 would not be considered a *capstone course*, most students had taken enough classes in the College of Agriculture to build upon foundational concepts presented in the course.

Limitations

Limitations were encountered in this study. First, having no ability to record the in-class portion of discussion, the researcher's measurement of students' in-class discussion participation was limited to frequency counts with minor adjustments for the quality of their participation. Second, because of the class size (62 students), those students who did not participate in the in-class discussion were not conspicuous. This may have affected students who were apprehensive about classroom participation because they may have perceived a lower expectation for participation and a greater level of anonymity when compared with a smaller class size (i.e., 20-25 students).

The level and amount of in-class discussion was another limitation. In previous years, including the semester when a pilot study upon which this research was founded was conducted, the course was taught by a seasoned professor who exemplified the inquiry method of learning through masterful facilitation of discussion. The data in this study were gathered from a class taught by an agronomy doctoral student who was assisted by a second

doctoral student; both had substantial backgrounds in sustainable agriculture. The two graduate students performed their first major teaching role in a commendable fashion; however, the level and amount of in-class discussion did not match the discussion the researcher had observed during a semester-long evaluation in two previous years.

A final limitation was related to sample size. A study of a 62-student class represents limitations of generalizability and statistical power. Analyzing a variable as categorical rather than continuous furthers the statistical limitation. Specifically, in additional analysis the CAPS score was used to classify students as high-, low-, or non- CCA (classroom communication apprehensive). As previously explained in Chapter 4, one standard deviation above the mean of the CAPS instrument was used to classify a student as a high-CCA. Similarly, one standard deviation below the mean was used to classify a student as a low-CCA. The remaining students were classified as non-CCA. The grouping sizes (nine high-CCA, six low-CCA, and 41 non-CCA) greatly reduced the probability of a statistically significant result when analyzing the contention that high-CCA students utilized online threaded discussion more than their low- or non- CCA peers.

Observations

The CAPS variable was a moderate correlate of students' in-class discussion participation. The rating of students' in-class discussion participation had a positive skew and 27 out of 62 students (43.5%) were rated as low (represented as a 1) or medium-to-low (represented as a 2) on a scale of 1 to 5, based on the rating of their in-class discussion participation. What this means, unfortunately, is that there were a number of students who did not participate much in the in-class discussion.

The computer-mediated communication apprehension (CMCA) variable showed promise as a predictor of students' participation in online discussion. The failure of CMCA to achieve statistical significance as a correlate of students' online threaded discussion participation may possibly be attributed to the influence of grading the discussion.

The information technology fluency variable did not provide a positive contribution in determining the amount of online participation the students exhibited. The regression coefficient of this variable, although statistically significant, was negative; implying the more information technology fluent the student the less their participation in the online threaded discussion forum.

Internet access (IAI) was not a predictor of students' online threaded discussion participation (OTDP). IAI had the lowest correlation with the OTDP score of all predictor variables. One reason, similar to the CMCA variable, may have been due to linking part of the course grade students' participation. That is, there may have been an incentive to participate because it affected the students' course grade and that may have over-shadowed an accurate determination of participation based on factors such as Internet access speed.

Conclusions

Based upon the nature of the fall 2003 Agronomy 450 class, taking into account the limitations and observations, the following conclusions were made as a result of this study. Although high classroom communication apprehensive (CCA) students exhibited lesser amounts of classroom discussion, it appeared that, as a group, high computer-mediated communication (CMC) apprehensive students did not let their apprehension stand in the way of attempting to achieve the maximum class points allotted for participation in an online

threaded discussion forum. It is conceivable that, because in-class participation implied a weekly commitment and the online discussion participation could have been satisfied in only three sessions during the semester, performing an uncomfortable task was less demanding for the high-CMC apprehensive students as compared to the high-CCA students. Another issue could have been that students were required to do a self-report of their weekly classroom contributions. This self-report was based one third (1/3) on in-class discussion participation and two thirds (2/3) on a summary of class content. Most students received maximum credit for the summary of class content. Students who didn't contribute to the in-class discussion weren't left *empty-handed* on the weekly self-report of their contributions whereas failure to participate in the online discussion may have been a more obvious shortcoming.

Another conclusion of this study could have been that the influence of discussion being graded may have altered students' responses. Figure 9, which follows, shows the distribution of student online threaded discussion participation points for the semester. A maximum of 12 points was applied towards a student's course grade although students were encouraged to participate freely. A rapid drop-off is evident beyond the 12-point level.

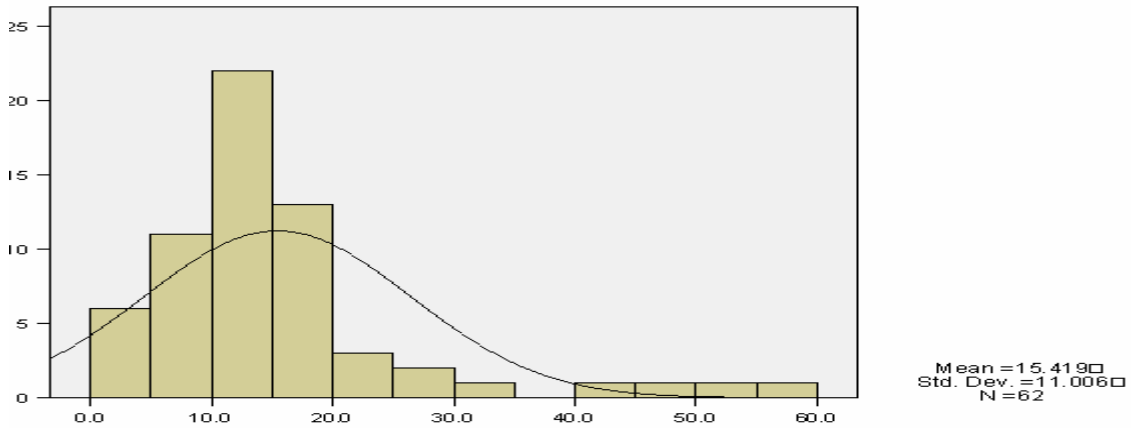

Figure 9. Distribution of student's online threaded discussion participation points.

A second indicator of students' focus on points towards their course grade is reflected in the distribution of online posts over the three 5-week grading periods. Figure 10, Online threaded discussion forum posts per day, provides a vivid illustration of when the cut-off for the three grading periods occurs. On a positive note, an upward trend in the average number of posts per week is evident. The gap between days 82 and 89 represents the Thanksgiving holiday break.

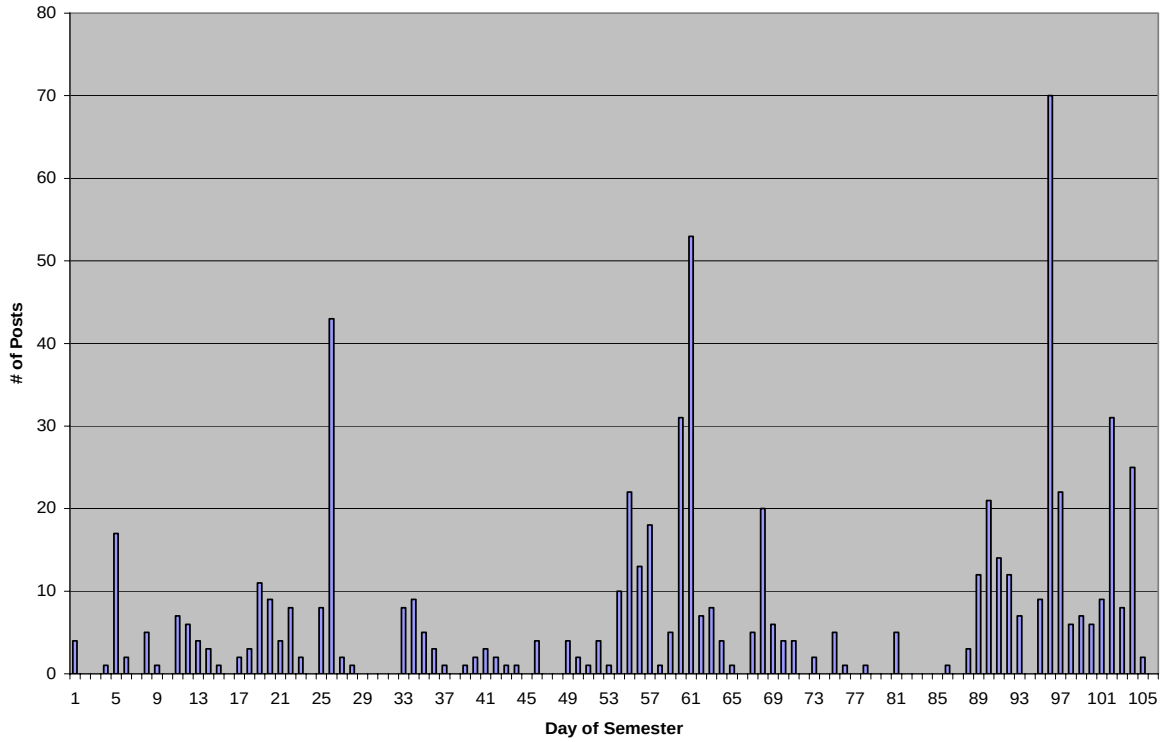

Figure 10. *Online threaded discussion forum posts per day.*

The CEW fluency variable did not make a positive contribution to the research model. One possible reason could have been that all students had an adequate level of information technology fluency to participate in the process of online discussion. Although speculative, one may be able to draw the conclusion that the observed variability of CEW fluency could be a positive determinant of participation in an online threaded discussion forum *below* a

threshold level, but not *above*. The inverse relationship between online threaded discussion forum participation and CEW fluency *above* a possible threshold level remains of interest.

Students who had limited access to the Internet did not let this limitation stand in the way of participating in an online threaded discussion forum. The preceding Figures 10 and 11 illustrate students' behavior which may have been influenced by the impact of grading discussion as part of the course grade. The results of several previous studies, along with the results reported here, support dropping Internet access as a variable in future studies. For example, Perse and Ferguson (2000) found that Internet access was negatively related to web use. Wu and Turner (2006) found high speed Internet access affected the number of messages students *read* not the number of messages they *posted*. The influence of grading students' participation in an online threaded discussion forum may have been an issue in Wu and Turner's study as well. A fitting conclusion to the discussion of Internet access speeds may be found in the following opinion, offered about their study, by Pena-Shaff, Martin, and Gay (2001).

> Differences in communication rates on the BBS were probably due more to personal choices (whether to make time to post a message) than to typical face-to-face obstacles, such as interruptions by other participants, time constraints, inadequate access to course materials, or fear of speaking in front of peers. (p. 62)

Further, additional analysis did not support the contention that high-CCA (classroom communication apprehensive) students utilized online threaded discussion more than their low- or non- CCA peers. Despite the lack of statistical significance, possibly because of the small group sizes of nine high- and six low- CCA students, it is still possible to conclude that *some* high-CCA students might take advantage of an online threaded discussion forum as an

alternative to in-class participation. Despite the possible benefits of implementing an online threaded discussion forum, MacKinnon (2000) urged caution in the adoption of technology:

> Many educators strive to incorporate technology into their teaching, spurred on by a whole host of political and public pressures as well as an assumption that technology "can" enhance instruction. While we can continue to "add" technology to what we do in classrooms, there is certainly a growing sense that we must completely reconsider how learning happens and what role technology may have. The notion of integrating computer technologies in substantive constructivist exercises that promote critical thinking, appears to be the best approach to date in terms of ensuring conceptual change will occur. (¶ 1 under heading *Conclusions*)

Recommendations to the Profession

Based upon the preceding conclusions, the following recommendations are made which might benefit instructors who are creating or revising a face-to-face or online course and are considering adding an online threaded discussion forum.

Accommodating Apprehensives

Adding an online threaded discussion forum may provide better educational results if the course structure is designed with certain characteristics. The results of this study confirm the work of Neer (1987, 1990) and others (Campbell & Neer 2001) that classroom communication apprehensive students participate less in classroom discussion. Apprehension of computer-mediated communication may also restrict some students' participation in an online threaded discussion forum. Therefore, a course scoring rubric that allows students to achieve a majority of the course points without being required to participate in classroom discussion may alleviate the higher level of apprehension some students face. This is not to

imply that students should be exempt from participation. Other forms of participation in lieu of class discussion may engage students in the process of knowledge construction as discussed earlier in Chapters 1 and 2. Allowing students to research, summarize, and bring into the class supplemental information about the topics being discussed may provide an attractive alternative whereby students are still participating. Allowing students some flexibility in the role of determining discussion topics, participating in the discussion, and summarizing key points of the discussion may also reduce their apprehension level. For example, instructors may wish to provide an a la carte course scoring rubric, with some minimum requirements in each category.

Group Functions and Sizes

Participation in an online threaded discussion forum may be increased if groups are smaller than the single group of 62 students who were enrolled in Agronomy 450. Breaking students into groups which perform specific tasks may provide an opportunity for more participation. By design, over the course of the semester, students would rotate among groups so all students could experience different roles.

For example, the instructor might break the class into three groups, identified here as groups A, B, and C with their related tasks. Group A determines what should be discussed and poses the starter questions for the discussion which will follow. Synchronous communication, such as the chat function which is built into most course management systems (Blackboard, WebCT, etc.) allows this task to be performed quickly. In many online courses there may be no ability to have a set time for students to meet in a chat session. The

same function could be performed asynchronously within several days if students are required to login daily to complete this portion of the groups' task.

Students in group B, or a set of groups, depending on the number of students enrolled in the course, perform the bulk of the discussion. A discussion facilitator can assist with this phase by helping the students to stay focused on the discussion and on-task. To assist in focusing the discussion, instructors or discussion facilitators are encouraged to structure the discussion so it results in an end product. Examples of end products are a list of the pros and cons of an issue or a set of recommendations for solving a perceived problem. Finally, students in group C summarize key points of the discussion, make concluding comments that tie the discussion into the course material being covered and post the summary to the online threaded discussion forum.

Guided Discussion

The instructor's role in discussion is important. With proper structure and facilitation, the instructor or other facilitators, such as teaching assistants or student group leaders, can guide the discussion. This facilitation of the students' posts to an online threaded discussion forum might assist in continuing message threads by challenging students to justify their responses and/or further their thinking. This encourages students to participate beyond the passive approach that is made possible if students are allowed to only post a required number of messages to receive points without regard for the quality of and/or the content of the messages. If an online threaded discussion forum is supporting a face-to-face class, instructors are encouraged to tie the online discussion into in-class course content and in-

class discussion which may follow. This may increase the students' participation in both the in-class and online discussions.

Scoring Rubric

A scoring rubric that is specifically tailored for evaluating discussion should be used. This kind of rubric can also encourage students to participate beyond the passive approach previously mentioned. Grading rubrics were discussed in Chapter 2, and a summary of those rubrics and additional information for comparing them is included in Appendix D. At the very least, students should "walk through" the scoring rubric that will be used to calculate part of their class grade so they can understand how the rubric will be administered. This understanding can help students clearly grasp the instructor's expectations in terms of their participation in discussion. Further steps might be to involve students in creating the rubric or to require that students evaluate each other's discussion participation. To avoid the problems associated with the tendency toward lenient evaluation of one's peers scores, the instructor may want to use a forced distribution system similar to the one proposed by Melvin and Lord (1995).

Evaluation Period

Finally, as was made evident by Figure 10, Online threaded discussion forum posts per day, online discussion need to have shorter period between evaluations. Several factors may be used in determining the length of the evaluation periods. One factor is whether the threaded discussion forum supports a face-to-face class or an online class and, in the face-to-face environment, the number of class meetings per week. Class meetings per week are more ambiguous in the online environment; however, the expectation of students logging on once,

twice, or more times per week can be, and should be, addressed in the course introduction. Online classes may need to have longer evaluation periods if the students are not required to connect to the course a prescribed number of times a week. Instructors are encouraged to consider the course content, potential discussion topics, and the abilities (or willingness) of the students when determining the length of the evaluation period.

Recommendations for Future Research

First and foremost, moving beyond a study of one class is needed to validate results, provide generalizibility, and increase the statistical power of the findings. Although this study provided an insight into an online threaded discussion forum for students in the College of Agriculture who were enrolled in an issues-based class, the results obtained cannot be generalized far beyond that small population.

The computer-mediated communication apprehension construct remains of interest, particularly in light of the significant findings of classroom communication apprehension. Further refinement of an instrument to better measure CMC apprehension may be needed. Several researchers (Brown, Fuller, & Vician, 2002; Scott & Timmerman, 2005) have used instruments other than the CMCA Scale (Clarke, 1991) used in this study. Testing multiple instruments together, with a larger population, is recommended to determine if any of the instruments exhibit the ability to predict the amount of students' participation in an online threaded discussion forum. If none of the instruments provide satisfactory predictive power, a decision needs to be made whether to further refine or develop a new CMC apprehension instrument or to drop CMC apprehension from further consideration.

Neither the Computer-Email-Web Fluency Scale instrument nor the Internet access indicator provided a positive contribution to the research model in the present study and dropping them from future studies is recommended. An instrument developed by Spitzberg (2006) may hold promise as an additional predictor variable. Spitzberg created both a model and a measure of CMC competence. The 77-item instrument contained 15 categories including motivation, knowledge, skills, selectivity, appropriateness, effectiveness, and clarity in determining an individual's competence with computer-mediated communication. The instrument was being prepared for data collection at the time of the publication which introduced it and its corresponding model. Once reliability is established, the CMC competence instrument may provide additional explanatory power to a model which attempts to predict the amount of students' participation in an online threaded discussion forum. Please refer to Figure 11, which follows, provides an overview of Spitzberg's CMC competence model.

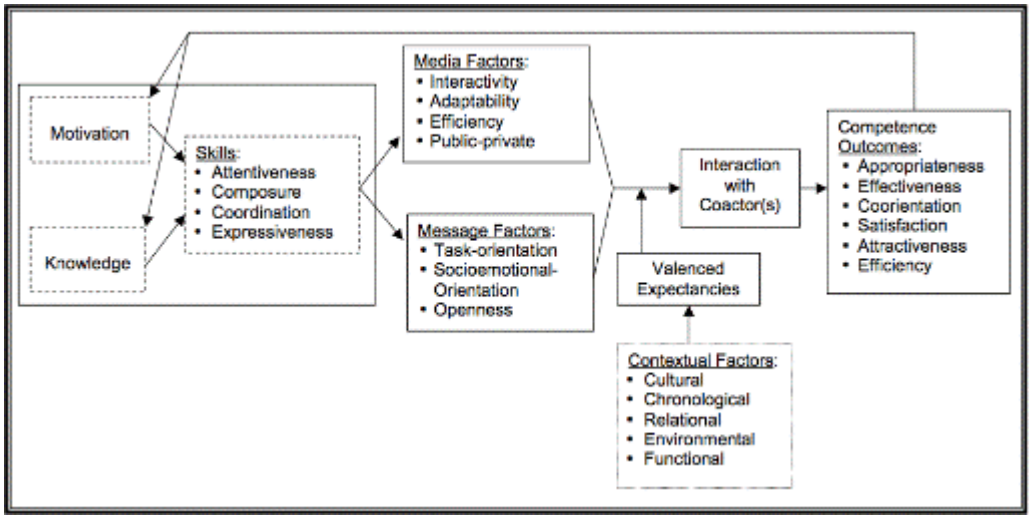

Figure 11. Spitzberg's (2006) CMC competence model.

Proposed Research Design

The proposed research model which concludes this study will *not* measure students' in-class discussion participation. One obvious benefit of this is the ability to test the research model in classes with little or no in-class discussion, potentially providing a much larger sample size. A second benefit is that, even in classes that do utilize in-class discussion, the time required for instructors to carefully monitor and report students' in-class discussion participation limits the ability to gather research-quality data. The inclusion of the CAPS variable in the proposed research model *will* allow the research question to be asked regarding whether high-CCA (classroom communication apprehensive) students participate more in an online threaded discussion than their low- or non- CCA peers. Knowing the amount of in-class discussion participation is unneeded to answer this research question. Knowing whether high-CCA students participate more in an online threaded discussion than their non low- or non- CCA peers may provide a valuable recommendation to the profession; namely whether the incorporation of a threaded discussion forum into a face-to-face class can provide an alternative participation opportunity to students who are high-CCA. Near's (1987) measure of classroom apprehension was not limited to classroom discussion. A class with little discussion, but other forms of required participation, can still create an uncomfortable environment for a high-CCA student.

Three additional variables, one used as a control and two as a moderators, may provide additional explanation in the research model being proposed. First, some measure of students' academic performance (or capability) should be included in the proposed research model because the results of the present study found a statistically significant relationship (r = .60) between GPA and online threaded discussion participation, the same outcome

variable as in the proposed research model. Student's cumulative college grade point average (GPA) was used in this study; however, all but two of the 62 students were juniors and seniors. When using student samples that contain underclassmen, particularly freshman, college GPA may not provide an accurate indication of students' academic potential. Additionally, college GPA is unavailable for a first-semester freshman. Although more difficult to obtain, scores from a standardized achievement test such as ACT or SAT may be the most accurate variable to control for differences in students' academic performance (or capability). High school GPA is not recommended as a measure of academic performance because it may vary significantly from an eventual cumulative college GPA due differences in the academic difficulty of respective students' high schools. In addition, high school GPA does not indicate how well students scholastically adapt to college.

A moderator variable of interest in the proposed research is a composite of students' educational motivation and/or subject matter interest. This variable was also absent from the present study. The CMC competence model which Spitzberg (2006) introduced includes five questions categorized as motivation; however, they relate specifically to an individuals' motivation to use CMC. Students' educational motivation and/or their interest in the content of a specific course may be indicators of students' participation in an online threaded discussion forum. Determining this composite measure and minimizing the multicolinearity which may exist between it and the measure of academic achievement is far beyond the scope of this discussion; however, that does not minimize its importance.

The second moderator variable included in the proposed research model is demographic information. Although gender was not an issue in the present study, it and ethnicity may be factors at a diverse campus. Also a *gender by ethnicity* interaction effect could exist.

Proposed Research Questions

The following two research questions are proposed in a future study.

Proposed Research Question One

> *Is there a statistically significant positive linear relationship between students' classroom communication apprehension and their participation in an online threaded discussion forum after controlling for academic achievement, demographics, and educational motivation/subject matter interest?*

The predictor variables for this question will be the students' scores on the Classroom Apprehension Participation Scale (CAPS) instrument. Students GPA (or similar measure of academic achievement/capability) will be the control variable with a composite measure of students' educational motivation and/or subject matter interest and demographic profile information as a moderator variables. The outcome variable will be a measure of students' Online Threaded Discussion Participation. The expected result will be that the CAPS score will have statistically significant positive linear relationship with the amount of students' online threaded discussion participation. A multi-step linear regression model will be used to determine the relationship.

Proposed Research Question Two

> *Do the variables of CMC Apprehension and CMC Competency significantly predict the level of students' participation in online discussion after controlling for academic achievement, demographics, and educational motivation/subject matter interest?*

The predictor variables for this question will be the students' scores on a CMC apprehension instrument and a CMC competence instrument. The control, moderator, and outcome variables are identical to those in research question one and are as follows. Students

GPA (or similar measure of academic achievement/capability) will be the control variable with a composite measure of students' educational motivation and/or subject matter interest and demographic profile information as a moderator variables. The outcome variable will be a measure of students' Online Threaded Discussion Participation. The expected result will be that the CMCA score and CMC Competence score are statistically significant predictors of the amount of students' online threaded discussion participation. A multi-step linear regression model will be used to determine the relationship.

A graphical representation of the proposed research model follows as Figure 12 and is a visual summary of the relationships among variables in both research questions. The bold-outlined boxes on the left-hand side of the model represent the predictor variables, control variable, and the moderator variables, while the box on the right-hand side of the model represents the outcome variable. The research questions are shown as rectangular boxes between the predictor and outcome variables. The lines represent the relationships between the predictor variables and the outcome variables that will be determined by regression analysis.

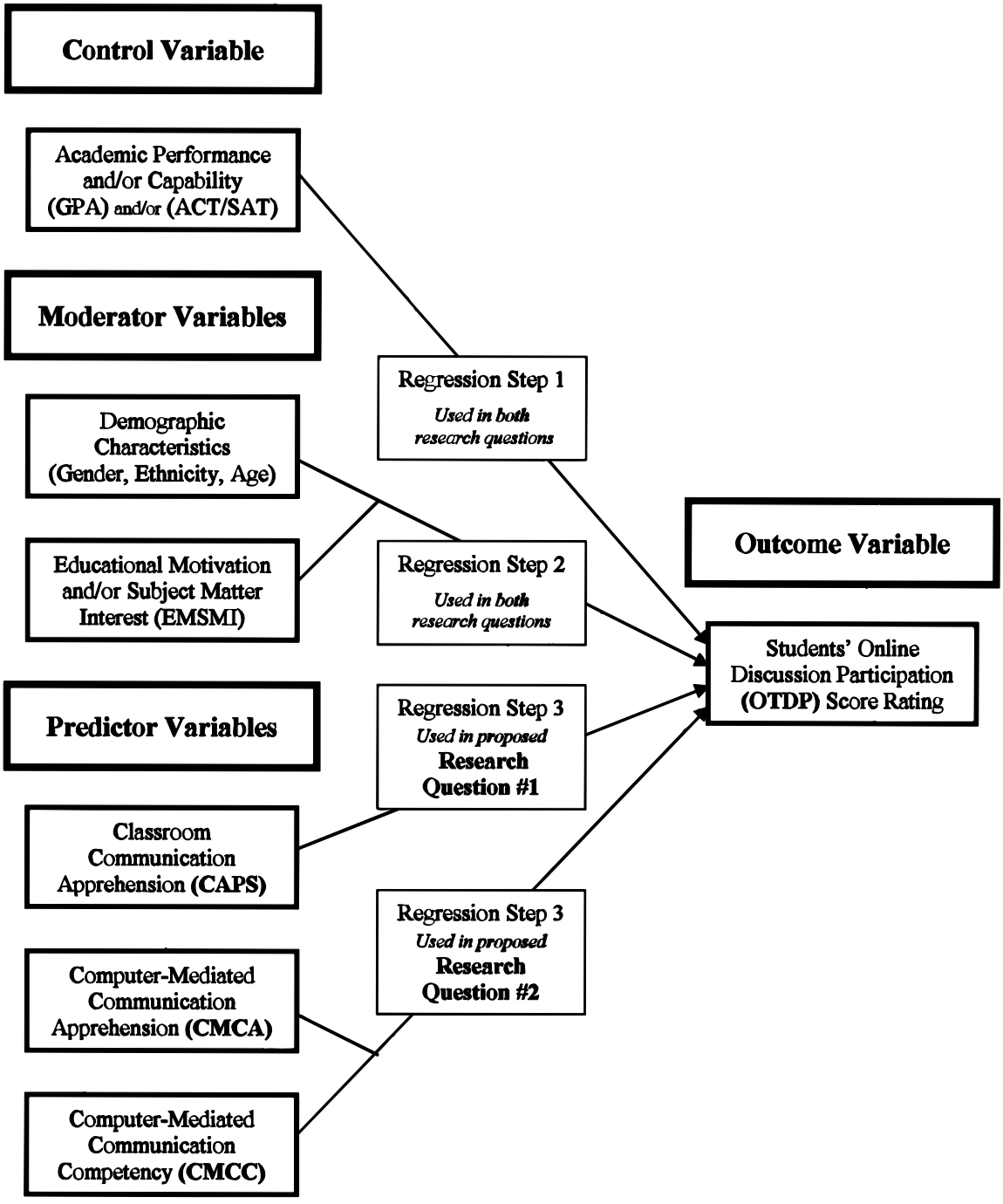

Figure 12. Proposed model – More factors affecting college students' discussion.

CMC apprehension is one of the predictor variables in research question two of the proposed research model. If it is found to be a correlate with the level of students'

participation in an online threaded discussion forum then future research could be based upon developing instructional strategies in facilitating threaded discussion forums that may help reduce students' CMC apprehension level. In his work with classroom apprehension, Neer (1987) developed instruction strategies to reduce classroom communication apprehension. A thorough search of the literature did not reveal studies which moved beyond the areas of identifying or measuring CMC apprehension into the area of reducing CMC apprehension levels. If CMC apprehension levels are reduced, students may increase their participation in class discussion which, as addressed in Chapters 1 and 2, may increase their knowledge construction.

The possibility of developing more instructional strategies in facilitating threaded discussion forums that can help increase students' CMC competence or educational motivation and/or subject matter interest also exist. As was stated with CMC Apprehension, the first step is to discover whether the variable in question is a correlate, Again, it could be expected that an increase in participation in class discussion could lead to an increase in students' learning outcomes.

APPENDIX A
DATA COLLECTION INSTRUMENTS

NOTE : The five data collection instruments listed above had IRB stamps when administered. *See Appendix C – Informed Consent Document for an example IRB stamp*. Originals, less the IRB stamp, were used in this appendix for reproduction clarity.

CLASS APPREHENSION PARTICIPATION SCALE

The following questions are measured with a Lickert-type response scale. Please circle the response indicating the degree to which you agree or disagree with the statements using the scale below:

I **Strongly Agree** with the statement
I **Moderately Agree** with the statement
I am **Neutral** to the statement
I **Moderately Disagree** with the statement
I **Strongly Disagree** with the statement

		SD	MD	N	MA	SA
1	I worry that the instructor will call on me during class.	1	2	3	4	5
2	If I have a question I want answered, I usually wait for someone else to ask it in class.	1	2	3	4	5
3	I don't like speaking in class because I feel that I do not have as much to say as most other students.	1	2	3	4	5
4	I usually do not speak in class unless called on by the instructor.	1	2	3	4	5
5	I have difficulty organizing my thoughts when I want to say something in class.	1	2	3	4	5
6	I enjoy assuming the role of leader during a class discussion.	1	2	3	4	5
7	I often hesitate to speak during class discussions because many other students seem to be more fluent than me.	1	2	3	4	5
8	I don't like speaking in class even when I think I know an answer to a question asked by the instructor.	1	2	3	4	5
9	I like participating in discussion because I feel I can convince others about what I am saying.	1	2	3	4	5
10	I always avoid speaking in class discussion if possible.	1	2	3	4	5
11	If the instructor called on me during class discussion I would feel at a loss for words or wouldn't know what to say.	1	2	3	4	5
12	I participate in class discussion more often than other students.	1	2	3	4	5
13	I am often afraid that the instructor or the class may not understand what I am trying to say during discussion.	1	2	3	4	5
14	I would rather listen than participate in a class discussion.	1	2	3	4	5
15	I like speaking during class discussion because most students listen to what I say.	1	2	3	4	5
16	I am hesitant about speaking in class unless the instructor specifically asks for questions from the class	1	2	3	4	5
17	I am often afraid I will say something that is wrong during a discussion.	1	2	3	4	5
18	I would speak during a class discussion even if I was not required to do so for part of my grade in the course.	1	2	3	4	5
19	I usually feel too tense or nervous to participate in class.	1	2	3	4	5
20	I avoid enrolling in classes that I think require class participation.	1	2	3	4	5

INITIAL RESEARCH QUESTIONNAIRE - AGRONOMY 450, FALL 2003

The following questions are measured with a Lickert-type response scale. Please circle the response indicating the degree to which you agree or disagree with the statements using the scale below:

I **Strongly Agree** with the statement
I **Moderately Agree** with the statement
I am **Neutral** to the statement
I **Moderately Disagree** with the statement
I **Strongly Disagree** with the statement

		SA	MA	N	MD	SD
1	On-line discussion allows for a more thought-out response than in-class discussion.	1	2	3	4	5
2	I prefer the spontaneity of in-class discussion as opposed to on-line discussion.	1	2	3	4	5
3	On-line discussion allows class time to be spent on more important things.	1	2	3	4	5
4	I feel more comfortable making my comments on-line.	1	2	3	4	5
5	Certain people seem to dominate in-class discussion.	1	2	3	4	5
6	On-line discussion is a way of making me put more time into the class.	1	2	3	4	5
7	In-class discussion allows for an immediate feedback. Some of the on-line comments never get a response.	1	2	3	4	5
8	I don't mind putting in the extra time that on-line discussion requires.	1	2	3	4	5
9	It's a hassle jumping around to the comments that are posted to the previous replies, then I have to re-read the comment they are replying to.	1	2	3	4	5
10	I prefer to know who's talking, and that's harder to do on-line.	1	2	3	4	5
11	With in-class discussion, there is less chance of "beating a topic to death" because the instructor(s) will move the discussion along	1	2	3	4	5
12	On-line discussion is good because you can go back later and re-read the comments at a later date.	1	2	3	4	5

13. As originally explained the first day of class, the total of 30 points for participation will consist of 20 points coming from in-class discussion, and 10 points coming from the online discussion.

Would you prefer an alternative scoring system where you have more flexibility in what % comes from in-class versus on-line discussion? As an example: you could have 20 points come from on on-line discussion and 10 points come from in-class, or a mix of 15 points coming from each, or the original breakdown as explained in the paragraph above.

Would you prefer flexibility in determining what percentage of points come from each type of discussion?
____ Yes _____ No

14. Student participation will continue to be a strong aspect of this class, but the instructors are open to changes in how the discussion is structured. This includes changes to either the in-class or on-line discussion. What suggestions would you make regarding ways to change how the discussion is facilitated?

_____

_____

_____

15. The instructors can possibly provide more feedback to specific comments made in the on-line discussion. These replies may be made to privately to you, or posted for the entire class to see depending on the nature of your comment.

Do you see a value of instructor feedback made to your comments?
____ Yes _____ No _____ I'm not sure

Would you prefer the instructor's comments to be made ONLY to you, NOT to the entire class? ____ Yes _____ No _____ I'm don't care either way

16. Do you have access to a computer where you live? ____ Yes _____ No

17. Is it exclusively for you, or do you share it with others?
_____ Exclusively mine _____ Shared with others

18. Answer only if shared with others was your choice above?
There are approximately _____ computers shared between _____ people

19. If you have access to a computer where you live, is it connected to the Internet?
____ Yes _____ No
Note: If you have access to more than one, answer yes if either is connected to the Internet.

20. If connected to the Internet, my connection is:
_____ Dial-up (through standard telephone line) _____ High speed (always connected)
Note: If you have access to more than one computer, choose the fastest type of connection..

21. If you only have a standard dial-up connection, do you limit your computer time on-line so you don't tie up the phone line? ____ Yes _____ No _____ Not Applicable

22. Do you have your own cell phone? ____ Yes _____ No

23. If you only have a standard dial-up connection, do you find you'd like to get on-line, but someone you live with is already on the phone line you use for the computer?
_____ Often _____ Occasionally _____ Seldom _____ Not Applicable

24. If you only have a standard dial-up connection, do you prefer to use the computers on campus when you are doing things on the Internet?
_____ Often _____ Occasionally _____ Seldom _____ Not Applicable

25. If you only have a standard dial-up connection, please list the reasons you prefer to use the computers on campus when you are doing things on the Internet (check all that apply).
_____ Accessibility issues at home.
_____ I prefer to save money because I have to pay for my on-line time.
_____ I have adequate time between classes to get on the Internet
_____ Other reasons (please list) _____
_____ Not Applicable

COMPUTER-MEDIATED COMMUNICATION APPREHENSION SCALE

The following questions are measured with a Lickert-type response scale. Please circle the response indicating the degree to which you agree or disagree with the statements using the scale below:

I **Strongly Agree** with the statement
I **Moderately Agree** with the statement
I am **Neutral** to the statement
I **Moderately Disagree** with the statement
I **Strongly Disagree** with the statement

		SA	MA	N	MD	SD
1	I have no fear of using a computer to communicate with other people.	1	2	3	4	5
2	Using computers to participate in group discussion would be very exciting to me.	1	2	3	4	5
3	I would enjoy sending a message to others using a computer.	1	2	3	4	5
4	I feel confident in my ability to clearly express ideas using a computer to communicate.	1	2	3	4	5
5	I don't think I would be as good as others in using a computer to communicate.	1	2	3	4	5
6	I would be calm and relaxed using a computer to share ideas with others.	1	2	3	4	5
7	I face the prospect of using electronic mail with confidence.	1	2	3	4	5
9	It bothers me to think I will probably not know exactly who reads the electronic mail I send.	1	2	3	4	5
10	It would make me nervous to use a computer to communicate any important information.	1	2	3	4	5
11	In using a computer to exchange valuable ideas, I'm afraid my ideas would be used without my permission.	1	2	3	4	5
12	It makes me nervous to think that a lot of other people could read the electronic mail I send.	1	2	3	4	5
13	I feel excited and enthusiastic thinking about using a computer to communicate with others.	1	2	3	4	5
14	I have the ability to be an effective computer communicator.	1	2	3	4	5
15	I would not be very good at computer communicating.	1	2	3	4	5
16	Using a computer to communicate with others is just not worth the effort.	1	2	3	4	5
17	If I had a choice, I would never use a computer to communicate with other people.	1	2	3	4	5
18	I feel insecure about my ability to use a computer to communicate with other people.	1	2	3	4	5
19	The challenge of learning to use a computer-mediated communication system is exciting.	1	2	3	4	5
20	If given the opportunity, I would like to use a computer communication system.	1	2	3	4	5
21	I always feel someone is looking over my shoulder monitoring every message I send.	1	2	3	4	5

COMPUTER-EMAIL-WEB (CEW) FLUENCY SCALE

If I asked you to perform certain tasks with the computer, email, or the web, how much thought would it require from you to perform these tasks without help, right now?

Please circle the best answer for each question.

For example, if you would only stop for a brief moment and then perform the task without problems, you may want to choose **"4, a little thought."** If you kind of remembered how to do the task, but it would require you to figure out how to do the task rather than really knowing it, you may want to choose **"2, a fair amount of thought,"** etc.

C1 For me, printing a document on a specified printer other than the default printer would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C2 For me, opening a previously saved file from any drive or folder would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C3 For me, saving a file would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C4 For me, saving a file in a specified drive/folder would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C5 For me, saving on a floppy disk would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C6 For me, using the computer hard drive would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C7 For me, moving files between drives and folders would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C8 For me, deleting unwanted files would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C9 For me, creating new folders would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C10 For me, renaming files would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C11 For me, saving a document as a template would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C12 For me, formatting a floppy disk would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C13 For me, switching a computer on would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C14 For me, recognizing when it is appropriate to use the “save as” function instead of the “save" function would require.

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C15 For me, switching between currently open applications would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C16 For me, beginning a new document based on a template would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C17 For me, restarting a computer would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

C18 For me, beginning a new document in an unfamiliar software program would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E1 For me, opening new email messages to read them would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E2 For me, deleting email messages would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E3 For me, sending an email message would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E4 For me, forwarding an email would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E5 For me, opening a file attached to an email would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E6 For me, accessing an unfamiliar email program would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E7 For me, saving an attached file would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E8 For me, blocking unwanted email senders from sending me mail again would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E9 For me, attaching and sending a file with a message would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E10 For me, using the address book to find an address would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E11 For me, creating my own Listserve would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E12 For me, setting mail preferences, i.e. “save sent emails,” would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E13 For me, using mail message settings. i.e. “important,” would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E14 For me, creating a signature file for outgoing email messages would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E15 For me, differentiating between a list of addresses in the Address Book and a Listserve would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E16 For me, replying to an email would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E17 For me, creating folders for saving mail would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E18 For me, creating an address in the address book would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

E19 For me, using a Listserve to send email would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W1 For me, finding information on a specific topic online using a search engine like Yahoo or Google would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W2 For me, using Internet email such as Yahoo or Hotmail would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W3 For me, understanding what elements of web sites are hypertext links usually would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W4 For me, opening a web address directly by typing the URL in the appropriate place would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W5 For me, adding bookmarks of useful web sites would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W6 For me, setting up a dial-up account to log on to the Internet would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W7 For me, turning on or off auto load images on web sites would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W8 For me, creating a professional-looking web site would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W9 For me, editing bookmarks, i.e. changing their default name, would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W10 For me, saving images off web pages to a disk would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W11 For me, using the “back” and “forward” buttons of a web browser to move between pages would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W12 For me, saving text contents off web pages to a disk would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W13 For me, identifying the host server from a web address would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W14 For me, using advanced search techniques in search engines would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

W15 For me, using a browser such as Netscape or Internet Explorer to navigate the web would require …

5	4	3	2	1
no thought	a little thought	some thought	a fair amount of thought	a great deal of thought

FINAL RESEARCH QUESTIONNAIRE - AGRONOMY 450, FALL 2003

Please place a check mark in the appropriate box, circle the number above the response scale listed below each question, or write in your answer in the space provided.

1. What was your agricultural background prior to starting college?

□ Extensive □ Moderate □ Limited □ None

2. What was your previous knowledge of sustainable agriculture prior to the start of this class? Please include personal experience and knowledge from other college courses when making your decision.

□ Extensive □ Moderate □ Limited □ None

3. What was your previous knowledge of environmental concerns prior to the start of this class? Please include personal experience and knowledge from other college courses when making your decision.

□ Extensive □ Moderate □ Limited □ None

4. Where did you typically sit?

□ Front 1/3 of room □ Middle 1/3 of room □ Back 1/3 of room □ I had no particular seating pattern

5. Do you have a job? □ Yes □ No

If yes, approximately how many hours do you work in an average week? _____

6. The pictures used to take attendance helped me recognize other students better.

5	4	3	2	1
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree

THE FOLLOWING QUESTIONS DEAL WITH THE **IN-CLASS** DISCUSSIONS

7. Compare your comfort level with **in-class** discussion at the end of the semester versus the beginning of the semester (how you feel now).

5	4	3	2	1
A **lot more** comfortable	A **little more** comfortable	Neutral /Same	A **little less** comfortable	A **lot less** comfortable

8. I was trying to join the **in-class** discussion, but was not called on or did not jump in.

4	3	2	1
Happened Often	Happened Occasionally	Happened seldom	Never Happened

9. I had something to say during **in-class** discussion, but other people asked the question before I raised my hand.

4	3	2	1
Happened Often	Happened Occasionally	Happened seldom	Never Happened

10. How do you feel about the level of integration of the on-line discussion into the following weeks **in-class** discussion?

5	4	3	2	1
Preferred a **lot more**	Preferred a **little more**	Neutral	Preferred a **little less**	Preferred a **lot less**

THE FOLLOWING QUESTION DEALS WITH THE **ON-LINE** DISCUSSIONS

11. Compare your comfort level with **on-line** discussion at the end of the semester versus the beginning of the semester (how you feel now).

5	4	3	2	1
A **lot more** comfortable	A **little more** comfortable	Neutral /Same	A **little less** comfortable	A **lot less** comfortable

THE FOLLOWING QUESTIONS DEAL WITH THE **ON-LINE** DISCUSSIONS

12. Learning more about sustainable agriculture was an influence in participating in the **on-line** discussions.

4	3	2	1
Strong influence	Some influence	Weak influence	No influence

13. Gaining participation points to raise my grade was an influence in participating in the **on-line** discussions.

4	3	2	1
Strong influence	Some influence	Weak influence	No influence

14. I felt a connection (or bond) to people whom I made **on-line** responses to or who responded to my on-line posting.

4	3	2	1
Strong connection	Some connection	Weak connection	No connection

15. I used the pictures of students available **on-line** when looking to see who was making an on-line comment.

3	2	1
Often	Seldom	Never

If never, which one of the following would explain why?

□ I remembered seeing it in class, but didn't know how to do it □ It took too much time
□ I was concerned about the comment, not who was making it □ I forgot it was possible until now
□ I didn't know it was possible at all □ I have no clue what you're talking about

16. I found the quality and content of the **on-line** discussions.

5	4	3	2	1
Very relevant	Somewhat relevant	Neutral	Somewhat irrelevant	Very irrelevant
5	4	3	2	1
Very interesting	Somewhat interesting	Neutral	Somewhat uninteresting	Very uninteresting
5	4	3	2	1
Very easy to follow	Somewhat easy to follow	Neutral	Somewhat hard to follow	Very hard to follow

17. Regardless of how I answered the above parts in question 16, I feel that **on-line** discussions, if appropriately administered and facilitated, should be added to more college courses.

5	4	3	2	1
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree

18. Do you think the level of structure for the **on-line** discussion was appropriate?

5	4	3	2	1
Prefered a **lot more** structure	Prefered a **little more** structure	Neutral	Prefered a **little less** structure	Prefered a **lot less** structure

THE FOLLOWING QUESTIONS DEAL WITH THE COURSE IN GENERAL

19. What is your age? ____ 20. What is your approximate (cumulative) grade point? _____

21. I felt the system of grading in-class and on-line discussion was fair.

5	4	3	2	1
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree

If you choose moderately or strongly disagree, why do you disagree, or what would you have done to make it better? Please write a brief comment on the **back side** of this sheet.

APPENDIX B
CLASS ARTIFACTS

Issues in Sustainable Agriculture

Agronomy/Environmental Studies 450

(2 credits)

Fall term 2003

Welcome!

Welcome to Issues in Sustainable Agriculture 2003! Thanks for joining this class. We hope this will be a worthwhile and enjoyable learning experience for all of us. Here is the proposed syllabus for the course. Please contact the instructors if you have any questions or suggestions. We wish you lots of luck for this semester!

1. Instructors

Valentin Picasso vpicasso@iastate.edu
Fred lutzi iutzi@iastate.edu

Contact information:

1207/1211 Agronomy Hall
(515) 294-6795
Office hours: Thursdays 2:30 — 4:30 pm and by appointment

2. Course objectives

At the end of the course the student will be able to:

- explain the concepts of: sustainability, system, agroecosystem, food system, paradigm, organic agriculture, alternative agriculture
- describe the foundations of the current agricultural system and assess its sustainability
- recognize alternative agriculture systems and assess their sustainability
- discuss issues in sustainable agriculture using reasonable arguments and a broad perspective
- think critically about the impacts of their own decisions as future professionals, farmers, and consumers on the planet
- identify key sources of information about sustainable agriculture for further learning and reference

3. Methodology

During the course the students will be exposed to:

- discussions in-class, within groups, and on-line
- direct experience with farming systems (field trip)
- readings from key thinkers of the sustainable agriculture movement
- short lectures from the instructors and guest speakers
- team work in a group project

Course textbook

Fatal Harvest: The Tragedy of Industrial Agriculture. Edited by Andrew Kimbrell. 2002. Book's webpage: http://www.fatalharvest.org/index.htm

Policy and evaluation

Activity	Points
Attendance and Participation	60
Team Project	20
Area of expertise	20
Total	100

4.1. Attendance and participation

4.1.1. In-class

The course is designed to foster exploration and constructive discussion regarding the purpose and future of agricultural activities. The quality of the course will therefore depend to a great extent on your preparation and contributions to classroom conversation. The importance of this is reflected in the fact that **attendance and participation are the most important components used to determine final course grades (60 %).** Please make every effort to attend each of our weekly meetings. When this is not possible due to an emergency, please inform the instructors as soon as you are able (you still may be able to recover some of those points). You will gain 2 points each time you come to class (and lose them if you are absent).

The best way to prepare for this class is to complete assigned reading prior to our meetings and to maintain a general awareness of current events in agriculture and agricultural and environmental policy. Read the popular press coverage of agricultural and environmental issues and consult the online resources to gain additional background and depth.

At the end of each class, you will be asked to take a few minutes to **grade your participation**. You will- answer the following two questions that will help us to determine if you were actively listening and participating:

1. What were the most important points of today's lecture and discussion?
   (worth I point per class, 13 points in all)
2. What comments or questions did you voice that contributed to the discussion?
   (worth 0.5 points per class, 7 points in all)

Your answers will be reviewed by the instructors.

Our class **field trip** will be a highlight of the semester and will provide discussion points and examples for our class activity throughout the term. Therefore we strongly encourage you to participate in this important event.

4.1.2. Electronic Discussion Group

In order to promote and facilitate interaction among all of us an online discussion group has been established through **Web CT (webct.iastate.edu)**. Please use this discussion group to continue the conversations started in class. The course constructors will monitor discussion and participate as needed on a daily basis. **Your participation in the on-line discussion will be graded (10 %)**

Attendance and Participation	60 Points
Attendance (2 per class)	30
class participation (1.5 per class)	20
On-line participation	10

4.2. Team — debate project

The goal of this activity is to develop **skills on working in teams** (not just groups) and provide to the class information and reflection on one issue in sustainable agriculture. During the semester, 5 to 6 class debates will be held on different issues in sustainable agriculture. For each debate, 2 teams will be in charge of providing with information and arguments for that issue (one for and the other one against). Potential topics are: Natural systems agriculture, subsidies, biotechnology, No-till systems, chemical inputs, organic agriculture, ...

Students will organize themselves in **groups of 5 – 6**. Each group should work as a team according to the following guidelines:

1. Select one topic or issue in sustainable agriculture, which is interesting to you and worth discussing with the class. Also, decide which side of the issue you will argue (it doesn't necessarily have to be the side that you are actually on).
2. Instructors will coordinate that 2 teams will work on each topic.
3. The team will gather information and write a short outline of the argument and submit it to the instructors.

4. The instructors will meet with each team separately, if needed, to provide feedback and discuss ideas.
5. The day of that debate, each team will take about ten minutes to present their arguments to the class. After the presentation, the whole class will debate the issue, and try to come to a conclusion.

4.3. Area of expertise

To capitalize on the collective knowledge of our class group, each individual will declare an "area of expertise." When our class discussions require a specific piece of knowledge, we will rely on the corresponding individuals to provide leadership and input. A one- to two-page written summary of your area of expertise will be expected at the end of the term. This will be bound with all other summaries and distributed to all course participants. The specific content of the summary should consist of the following:

- Why is this subject, technique or trend relevant to sustainable agriculture?
- Who are the authorities and important regulatory agencies involved?
- Where can a person go to learn more about the particular area? [Included people, reading, electronic resources]

This project will account for 20 % of the grade.

4.4. Box for comments/feedback

Every class you can send anonymous comments, suggestions, questions, or other kinds of feedback to the instructors.

5. Course contents

1. Conceptual foundations

1.1.Introduction. Conventional/industrial vs. sustainable/alternative agriculture. Definitions. The concept of paradigms.

1.2.Systems methodologies and system thinking. Some concepts of systems theory. Agroecosystems. Food systems.

2. The evolution of Industrial Agriculture

2.1.Transition from Biological Power to Mechanized Agriculture. Mechanization. Tillage. Actual vs. intended consequences.

2.2.The Green Revolution. Actual vs. intended consequences. The "greater yields" syndrome and the stimulus for production agriculture.

2.3.Industrial farming practices:

- Cropping systems, genetic resources
- Tillage and seeding methods
- Managing the fertility of the system
- Weed control and pest management
- Livestock production

3. Towards a more Sustainable Agriculture

3.1.Organic agriculture and other alternative agriculture models.

3.2.More sustainable farming practices:

- Cropping systems, genetic resources
- Tillage and seeding methods
- Managing the fertility of the system
- Weed control and pest management
- Livestock production

3.3.A broader picture: food systems

4. Philosophy and Agriculture

4.1.Sustainability. Ecological, economical and social dimensions. The global/international dimension. Philosophy of sustainable agriculture.

6. Evaluation and grades

Activity	Points
Attendance and Participation	60
Team Project	20
Area of expertise	20
Total	100

Note: attendance and participation is the most important factor in determining your grades.

Attendance and Participation	60 Points
Attendance (2 per class)	30
Class participation (1.5 per class)	20
On-line participation	10

Note: if you are absent one day, you miss 2 points for attendance, and 1.5 for participation (3.5 in total).

7. Important dates (tentative schedule)

Week	Dates	Activity
1	August 26	Class 1. Entry survey. Introduction.
2	September 2	Class 2. Systems thinking.
		Deadline for submitting your first assignment and Area of expertise.
3	September 9	Class 3: ***Field trip (tentative)***
4	September 16	Class 4. Industrial agriculture 1.
		Deadline for submitting Team project ideas.
5	September 23	Class 5. Industrial agriculture 2. Instructor's feedback on team project ideas.
6	September 30	Class 6. Industrial agriculture 3. ***Guest speaker 1***
		First evaluation of on-line discussion
7	October 7	Class 7. Sustainable agriculture 1. ***Debate 1 (tentative)***
8	October14	Class 8. Sustainable agriculture 2.
9	October 21	Class 9. Sustainable agriculture 3. ***Guest speaker 2***
10	October28	Class 10. Sustainable agriculture 4. ***Debate 2 (tentative)***
11	November 4	Class 11. Food systems. ***Guest speaker 3***
		Second evaluation of on-line discussion
12	November 11	Class 12. ***Debates 3 and 4 (tentative)***
13	November 18	Class 13. ***Debates 5 and 6 (tentative)***
14	November 25	***No class. Thanksgiving break.***
15	December 2	Class 14. Philosophy and agriculture. ***Guest speaker 4***
		Area of expertise project due.
16	December 9	Class 15. Exit survey. **Third evaluation of on-line discussion.**
17	December15	Exams week.

8. Optional activities schedule

See information on: http://extension.agron.iastate.edu/organicag/events.html

- Practical Farmers of Iowa Field Day: Franzenburg, Eric and Ann
  September 5 or 6/Van Horne
  6925 19th Ave., Van Horne, IA 52346-9876, 319-228-8758
- Practical Farmers of Iowa Field Day: Wahl, Tom/Dice, Kathy
  Saturday, September 13, 10:00-3:00/Wapello
  13882 I Ave, Wapello, IA 52653-9449, 319-729-5905
- Practical Farmers of Iowa Field Day: Thicke, Francis and Susan
  Friday, September 19/Fairfield
  1745 Brookville Road, Fairfield, IA 52556-8903, 641-472-8554
- Biological Composting Demonstration
  Saturday, September 20, 2003, 9 am - 4 pm
  Demonstration will be held at The Dairy Center, located just south of Northeast Iowa Community College at Calmar, Iowa. Guest speaker: Dr. Tom Richard, Iowa State University
- Practical Farmers of Iowa Field Day: Reinart, Stephen
  Tuesday, September 23, 11:30-6:00/Glidden
  29791 130th St., Glidden, IA 51443-8527, 712-656-2563
- Practical Farmers of Iowa Field Day: Henry A. Wallace Country Life Center
  Sunday, September 28/Greenfield
  PO Box 363, Greenfield, IA 50849, 641-337-5019 (Diane Welland, Director)
- ***The Prairie Festival XXV. September 26 – 28. The Land Institute — 2440 E. Water Well Road, Salina, Kansas.*** *Friday, 26 — Evening barn dance and, if drought permits, bonfire jam session; Saturday, 27 — all-day happening with talks, music, tours, art and supper with Kansas-grown food; Sunday, 28 — morning talks conclude at noon. Schedule and speaker bios are posted on The Land Institute's webpage at http://www.landinstitute.org.* ***Wendell Berry,*** *Kentucky poet, essayist and novelist, is the senior spokesperson of the agrarian tradition. Other speakers include* ***Winona LaDuke,*** *advocate of Native American rights and author;* ***David Korten,*** *critic of corporate influence;* ***Mas Masumoto,*** *California peach and grape farmer and author;* ***Charlie Melander,*** *innovative Kansas farmer; and* ***Wes Jackson,*** *President of The Land Institute. A* ***student rate of $10*** *for the weekend is being offered. The catered supper on Saturday is an additional $10, reservation required by September 19. Primitive camping is available.*

- Practical Farmers of Iowa Field Day: Adams, Don/Bonfils, Nan
  Saturday, October 4/Madrid
  1579 P Ave., Madrid, IA 50156-7568, 515-795-3288

- Place-Based Agriculture - The Economics, Ecology and Community Ethics Behind Self-Sufficient Farms, National Biodynamic Conference in Ames, Iowa
  November 14-16, 2003
  Sponsored by the Biodynamic Farming and Gardening Association, the conference will feature presentations by Dewane Morgan, Sarah Flack, Fred Kirschenmann, Janet Gamble, Walter Goldstein, John Reganold, and many others.
- **3rd Annual Iowa Organic Conference**
  Monday, November 17, 2003
  Scheman Building, Iowa State University- Ames, IA.

Date:

Name:

Your Today's Total grade: 0 0.25 0.5 0.75 1.0 1.25 1.5

1. What were the most important points of today's lecture and discussion? Please name them and explain two.

Your grade: 0 0.25 0.5 0.75 1

2. What comments or questions did ycu voice that contributed to the discussion?

Your grade: 0 0.25 0.5

APPENDIX C
APPROVALS AND PERMISSIONS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Research and Advanced Studies
Office of the Vice Provost
2810 Beardshear Hall
Ames, IA 50011-2036
515/294-8700
FAX: 515/294-7288

September 23, 2003

This is to certify Edwin Damman that completed web-based training on the protection of human subjects in research.

The web-based training covered the following topics:

- the historical perspectives of human subjects research
- the Belmont Report
- the federal regulations
- assurances of compliance
- Institutional Review Board (IRB) composition and duties
- elements of informed consent

In addition, we provide access to the Belmont Report, the Iowa State University Federal Wide Assurance filed with the Office for Human Research Protections, ISU policies and procedures through the Human Subjects Research Office web site at http://grants-svr.admin.iastate.edu/VPR/humansubjects.html and other resources available on the World Wide Web.

Rick Sharp
IRB Chair

Wolfgang Kliemann
Associate Vice Provost for Research &
Institutional Official Responsible for
Human Subjects Research

ISU IRB #2 03-741
EXEMPT DATE: September 30, 2003

INFORMED CONSENT DOCUMENT

Title of Study: **Analysis of Characteristics Influencing Student's Preferences For and Performance In On-line and In-class Discussions.**

Investigator: **Ed Damman**

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is: **to determine which student characteristics (if any) will determine a student's choice to use electronic discussion instead of participating in the classroom discussion. In addition, the student's actual performance, which is based on overall discussion points received for the entire course, will be compared to the aforementioned preference to see if performance matches preference. Student characteristics studied will include apprehension, computer familiarity, and computer access. In addition, some short answer questions will be asked of the students and then analyzed in hope of providing some additional insights beyond the survey questions.**

You are being invited to participate in this study because: **you are enrolled in an issues-based course with utilizes extensive class discussion.**

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, your participation will last for **the fall 2003 semester.** During the study you may expect the following study procedures to be followed.

You will fill out several questionnaires. You may skip any question that you do not wish to answer or that makes you feel uncomfortable."

RISKS

While participating in this study you may experience the following risks:
There are no foreseeable risks at this time from participating in this study.

BENEFITS

If you decide to participate in this study there **will be no** direct benefit to you. It is hoped that the information gained in this study will benefit society by **allowing the Agronomy department to make modifications to future sections of this class.**

COSTS AND COMPENSATION

You **will not** have any costs from participating in this study. You **will not** be compensated for participating in this study.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled.

ISU IRB #2 03-741
EXEMPT DATE: September 30, 2003

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: **Survey sheets will be coded, with no names attached. Only the researcher will have the key to cross match your names from the consent form with the survey sheets. This key will be kept at the principal investigator's private residence. Your name will not be included when reporting on individual comments from survey forms, if said comments are included in the write-up. The instructors of the class will have access to compiled survey results, not information regarding your individual information. Individual comments shared with class instructors will not be identified by your name. If the results are published, your identity will remain confidential.**

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during this study. For further information about the study contact **Ed Damman, (641) 751-3437 edamman@iastate.edu, or W.Wade Miller, 217E Curtiss Hall.** If you have any questions about the rights of research subjects or research-related injury, please contact the Human Subjects Research Office, 2810 Beardshear Hall, (515) 294-4566; austingr@iastate.edu or the Research Compliance Officer, Office of Research Compliance, 2810 Beardshear Hall, (515) 294-3115; dament@iastate.edu

****

SUBJECT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the signed and dated written informed consent prior to your participation in the study.

Subject's Name (printed) _____

_____ _____

(Subject's Signature) (Date)

INVESTIGATOR STATEMENT

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

_____ _____

(Signature of Person Obtaining Informed Consent) (Date)

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office of Research Compliance
Vice Provost for Research and
Advanced Studies
2810 Beardshear Hall
Ames, Iowa 50011-2036
515 294-4566
FAX 515 294-7288

TO: Edwin Damman

FROM: Ginny Austin, IRB Coordinator

RE: IRB ID # 03-741

DATE REVIEWED: September 30, 2003

The project, "Analysis of Student Characteristics Influencing Student's Preferences For and Performance in On-Line and In-Class Discussions" has been declared exempt from Federal regulations as described in 45 CFR 46.101(b)(2).

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

To be in compliance with ISU's Federal Wide Assurance through the Office of Human Research Protections (OHRP) all projects involving human subjects, must be reviewed by the Institutional Review Board (IRB). Only the IRB may determine if the project must follow the requirements of 45 CFR 46 or is exempt from the requirements specified in this law. Therefore, all human subject projects must be submitted and reviewed by the IRB.

Because this project is exempt it does not require further IRB review and is exempt from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects.

We do, however, urge you to protect the rights of your participants in the same ways that you would if IRB approval were required. This includes providing relevant information about the research to the participants. Although this project is exempt, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent, if applicable to your project.

Any modification of this research should be submitted to the IRB on a Continuation and/or Modification form to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

cc: Ag Ed

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2810 Beardshear Hall
Ames, Iowa 50011-2036
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TO: Ed Damman

FROM: Ginny Austin, IRB Coordinator

RE: IRB ID # 03-741

DATE REVIEWED: December 2, 2003

The project, "A Case Study of the Analysis of Factors Influencing Students' Preferences for Discussion Methods" regulations as described in 45 CFR 46.101(b)(2).

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

To be in compliance with ISU's Federal Wide Assurance through the Office of Human Research Protections (OHRP) all projects involving human subjects, must be reviewed by the Institutional Review Board (IRB). Only the IRB may determine if the project must follow the requirements of 45 CFR 46 or is exempt from the requirements specified in this law. Therefore, all human subject projects must be submitted and reviewed by the IRB.

Because this project is exempt it does not require further IRB review and is exempt from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects.

We do, however, urge you to protect the rights of your participants in the same ways that you would if IRB approval were required. This includes providing relevant information about the research to the participants. Although this project is exempt, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent, if applicable to your project.

Any modification of this research should be submitted to the IRB on a Continuation and/or Modification form to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

cc: AES

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TO: Ed Damman

FROM: Ginny Austin, IRB Coordinator

RE: IRB ID # 03-741

DATE REVIEWED: October 29, 2003

The project, "A Case Study of An Analysis of Factors Influencing Students' Preferences for Discussion Methods" has been declared exempt from Federal regulations as described in 45 CFR 46.101(b)(2).

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

To be in compliance with ISU's Federal Wide Assurance through the Office of Human Research Protections (OHRP) all projects involving human subjects, must be reviewed by the Institutional Review Board (IRB). Only the IRB may determine if the project must follow the requirements of 45 CFR 46 or is exempt from the requirements specified in this law. Therefore, all human subject projects must be submitted and reviewed by the IRB.

Because this project is exempt it does not require further IRB review and is exempt from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects.

We do, however, urge you to protect the rights of your participants in the same ways that you would if IRB approval were required. This includes providing relevant information about the research to the participants. Although this project is exempt, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent, if applicable to your project.

Any modification of this research should be submitted to the IRB on a Continuation and/or Modification form to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

cc: AgEd

APPENDIX D
SUPPLEMENTAL THEORETICAL BACKGROUND

APPENDIX D-1
FACE-TO-FACE DISCUSSION SCORING RUBRICS

Armstrong and Boud (1983) detailed a specific implementation of an extensive system used to assess class participation in many courses at the University of New South Wales in Australia. Although the assessment originated in the law school, it spread to other areas of the university such as engineering. In some courses, students were given the opportunity to identify criteria that would be used on the assessment. The assessment was usually made by the instructors; however, the form could work equally well for students to use in peer evaluations. The time of assessment varied by instructors. Some did it during class and some, concerned about the possible distraction, completed it after the class period was over. Still others delayed evaluation till the end of the semester but concerns of increased subjectivity were raised by Armstrong and Boud. In the specific example cited, half of the students were evaluated one week and the other half the alternating week. Students were not informed which week their participation was being recorded to prevent them from only participating in weeks when they were being evaluated. Four weeks served as a warm-up to allow students who may not be comfortable with discussion the chance to feel more at ease. Students were then evaluated four times (approximately every other week) for the remainder of the semester. Specific criteria used in the evaluation are shown in Table 11at the end of this appendix.

Bean and Peterson (1998) provided a prototypical example of an instrument they used and several variations of it used by other instructors at Seattle University. One variation was an instructor who practiced cold calling by using a deck of three by five cards with student's

names on them. The cards were randomly selected and students' responses to questions were recorded as strong, satisfactory, or unsatisfactory (which included absent). The marks on each student's card were tallied at the end of the semester. This adaptation reduced the holistic rubric in the prototype example to a three level cognitive-based interpretation. Bean and Peterson cited a potential weakness of this adaptation due to no consideration for the difficulty of the question.

Boniecki and Moore (2003) described a method where students were given a token for the correct response to an instructor's question. The tokens were then exchanged at the end of the class period for extra credit. This method of measuring participation shared some of the simplicity with the preceding variation of the Bean and Peterson model. Boniecki and Moore researched students' frequency of responses and students' response time after an initial baseline without tokens had been established. Student participation was double under the token economy but dropped to baseline levels after tokens were removed. The response time between instructor questions and student answers, which had dropped from six seconds during the baseline to under one second under the token economy, rose to about three seconds after tokens were removed, half of the response time measured during the baseline period.

Clarke (1985) described a system developed for use in seminars, where participation may have constituted up to 50 % of a student's grade. Clarke had established criterion that included elements from both the cognitive and affective domains and added some communication skills as well. The same criterion was used to evaluate students' written work. Clarke recorded the seminar and then evaluated the students' performance as the tape was replayed. Students were graded weekly and the tapes were often replayed with the

student to point out troublesome behavior or inadequate performance. The tapes also provided an objective record in case a dispute arose over a grade. Clarke noted that disputes were usually resolved early in the semester after a week or two of unsatisfactory grades.

Craven and Hogan (2001) described a complex rubric that contained observable characteristics of participation which had been used to score performance within eight criterion. The criteria (see Table 11) included cognitive, affective, and cooperative dimensions. The rubric complexity did not lend its use to mass evaluation therefore smaller class sizes may have been a limitation. Use of the instrument through multiple class periods may have been required depending on the amount of discussion expected and the instrument may also have been limited to teaching methods that exhibited a great deal of student participation.

Dancer and Kamvounias (2005) described extensive student involvement with an instrument measuring student participation in discussion which was used in tutorial sections of a lecture/tutorial course. Students spent part of two separate weeks developing criteria that were collated into five groups, as listed in Table 11. Students used the evaluation form to rate themselves and to rate other students. The course tutors rated all students. Students' evaluation of their peers served as a reliability check of tutors' evaluations and did not contribute directly to the other students' final participation scores.

Fischer (1975) provided a straight-forward rubric designed to reduce subjectivity in determining a participation score. Students received an *A* through *F* in eight areas containing cognitive, affective, and behavioral aspects. Initially developed to evaluate adult students taking classes for high-school credit, it was highly adaptable to grade level, class size, and teaching method. It has stood the test of time and contains many dimensions of evaluations

developed thirty years later. Allowing students the opportunity to determine what observable behaviors constituted the *A* through *F* ratings of the criteria may improve this solid instrument.

Melvin and Lord (1995) described a system titled the Prof/Peer method. The subjectivity of this simple system, with no rubric and sketchy criteria, was reduced by having all students rate every other student in class. To avoid leniency errors, students were required to use a forced distribution. Students ranked each other as high, medium, and low participating students, with equal numbers going into each of the three groups. The instructor had also ranked students into the three groups; however, no mention was made of forced distribution with the instructor's ratings. Students' ranking of each other did not negatively affect their peer's participation score. If the instructor score for the students' participation was higher than their peers, the instructor's score alone was used. If the instructor's score was lower, then an average of the instructor's score and the peer score was used. Details of specific criteria on what constituted high, medium, and low participation was not given.

Siegel (1977) used a simple form containing a single scale from 0 to 100. The scale had some bias toward cognitive contribution but some allowance was made for affective and behavioral dimensions. Few students scored less than 50 percent on this scale and fewer still below 20 percent. Students received their scores prior to the end of the semester which allowed the student some rebuttal to a score they felt was undeserved. Siegel stated that the system (even with it's simplicity and possible subjectivity) made the student aware of both the value of participation and how it was evaluated early enough in the semester that behavioral changes were possible.

Smith (1992) used a system in which a major feature was simplicity. Although it lacked the complexity of the multi-domain instruments, it provided a manageable system for use in a large lecture class. It required no outside observers, no instructor time during class, and little instructor time after class. It did, despite it simplicity, offer benefits. Students self-reported contributions they made during discussion which was incorporated into the lecture format of the class. Students submitted slips of paper containing a brief description of their contribution after class and the instructor verified that the interaction did take place, then recorded this information in the grade book. No more than three contributions per student were scored in any one class period. Since discussion was limited in the lecture format, the number of self-reports made during a typical class period rarely exceeded 15. This system was similar in theory to Boniecki and Moore's (2003) token economy but did not interrupt the flow of conversation to award tokens. In Smith's system, instructor verification was required and the student's self-report slips were returned the following class period, allowing the instructor familiarization with active students. It also allowed the instructor the opportunity to provide feedback to students who may have been stretching their self-report of contributions. "Good comment; however, I don't recall it being made in class" was sometimes written on the slips which Smith handed back to the students.

Zola's (1992) scored discussion system has been modified and re-reported by other researchers (Frazier, 1997; Leach, 1992). Primarily suited for middle or high school environments, it may find relevance in some post-secondary situations. The system used the fish-bowl technique as part of a whole-class activity. Some of the students pulled their chairs into a circle in the middle of the classroom and participated in an unscripted discussion on a specific topic. The remainder of the students in the classroom scored the discussion

participants using a standardized rubric. Students cycled through the process till all had been discussants.

Table 11. *Summary of face-to-face discussion scoring rubrics.*

Researcher(s)	Grade Level	Participation Mode	Assessed by	Criterion
Key Words	**Class Format**	**Who Developed Scale**	**Assessment Period**	**Comments**
Armstrong & Boud	College	Varies	Instructor or students	Cognitive, affective, expressive, learning process contribution, preparation, and attendance.
Participation in discussion	Numerous settings including lecture.	Instructor	Multiple times.	
Bean & Peterson	College	Voluntary	Instructor or students	Holistic rubric containing cognitive, affective, and expressive. where students score between 1 and 6.
Grading classroom participation	Numerous settings including lecture.	Instructor lead with extensive student input.	End of term, multiple times, single activity.	
Boniecki & Moore	College	Voluntary	Instructor	Designed as extra credit. Students awarded a "token" for correct answers to instructors' questions.
Token economy	Lecture, adaptable to other formats.	No scale. Based on frequency.	End of each class period.	
Clarke	College	Mandatory	Instructor	Content mastery, communication skills, synthesis/integration, creativity, valuing.
Grading seminar performance	Seminar adaptable to other formats.	Instructor	After class. Students notified weekly of grade.	
Craven & Hogan	Adaptable	Does not matter	Instructor	Communication, resources, openness to learn, respect, criticism, preparedness, and presence.
Assessing student classroom participation	Unknown-medium to small classes?	Instructor developed but could include students.	Complexity favors multi-period evaluations.	

Table 11 (continued)**.** *Summary of face-to-face discussion scoring rubrics.*

Researcher(s)	Grade Level	Participation Mode	Assessed by	Criterion
Key Words	**Class Format**	**Who Developed Scale**	**Assessment Period**	**Comments**
Dancer & Kamvounias	College	Mandatory	Tutors and students Semester midpoint and again at conclusion.	Preparation, contribution to the discussion, group skills, communication skills, attendance.
Student involvement in assessment	Tutorial (portion of lecture class)	Students		
Fischer	High school	Does not matter	Instructor	Contributions (from 3 possible areas), question asking, listening and other group dynamics issues.
Approach to evaluating class participation	Unspecified	Instructor	Quarterly	
Melvin & Lord	College	Voluntary	Inst. & student compared End of term. Could be used for single activity.	If student evaluation is higher, then averaged w/ instructor's. If student eval is lower, only instructor's used.
The Prof/Peer method	Lecture, adaptable to other formats.	No scale. Based on frequency.		
Siegel	College	Voluntary	Instructor; allows review End of term. Could be used for single activity.	Strong cognitive basis is used to evaluate contributions with affective and procedural influences included.
Objectivity evaluating class participation	Numerous settings including lecture.	Instructor		
Smith	College	Voluntary	Self-report (verified)	Students who participate in class discussion make a note of their contributions and hand to instructor.
Encouraging students' participation in classes	Classes larger than 60 students	No scale. Based on frequency.	After each class period	
Zola	Jr./Sr. High	Mandatory	Other students	Students receive 1 to 2 points for 8 positive behaviors and -1 to -3 points for any of 5 negative behaviors.
Scored Discussions	Whole-class activity	Instructor	Live activity	

APPENDIX D-2
ONLINE THREADED DISCUSSION FORUM SCORING RUBRICS

Bauer and Anderson (2000) considered three factors when establishing criteria for a rubric; content, expression, and participation. In the Bauer and Anderson rubric content was often given a higher percentage of the total grade because it reflected critical thinking. Expression was important because it gave the content clarity. Bauer and Anderson opined that good writing is synonymous with good scholarship and must be accorded a high place in assessment. Bauer and Anderson cautioned that online discussion might be divided into formal and non-formal postings. Non-formal postings would not receive as high of a percentage on expression, because in penalizing written equivalents of verbal transgressions that would normally go unnoticed in the classroom, one may reduce spontaneous debates and discussion that one is trying to foster.

Bauer and Anderson (2000) defended the quality component in participation. First, they stated that students needed to write regularly as a way to think on paper, thus they could discover what there was to say about a topic. Second, the writing allowed the student to interact with the instructor, creating trust which was a foundation for the learner-centered approach to learning. The final justification for quality was based on the level playing field which electronic communications created, giving reticent students the chance to help discussion flourish. The rubrics for formal and informal postings, along with a rubric to address a combination style discussion (Bauer and Anderson) are shown in Table 12.

Table 12. *Bauer and Anderson's (2000) online threaded discussion forum rubric.*

# of Points	Skills for FORMAL postings
9-10	Student uses complex, grammatically correct sentences on a regular basis; expresses ideas clearly, concisely, cogently, in logical fashion; uses words that demonstrate a high level of vocabulary; has rare misspellings.
7-8	Sentences are generally grammatically correct; ideas are readily understood but show signs of disorganization; some transitions between concepts are missing, especially with homonyms not detected with spelling checks.
5-6	Poor use of the language garbles much of the message; only an occasional idea surfaces clearly; language is disjointed; there is obvious overuse of simple sentences and repetition of words; paragraphs are often unrelated to each other.
1-4	Writing is largely unintelligible.
	Skills for INFORMAL postings
9-10	Contributions are prompt, timely, relevant, self-initiated; remarks are posted freely on all assignments throughout the course; there is no attempt to dominate the conversation.
7-8	Student generally keeps up with the discussion; needs an occasional prompt to contribute; might participate in some discussion more than others.
5-6	Participation is spotty; picks and chooses topics to get involved in; offers short, perfunctory postings when prompted; takes limited initiative.
1-4	Student rarely participated freely; makes short irrelevant remarks.
	Skills for COMBINATION STYLE postings
9-10	Demonstrates excellence in grasping key concepts; critiques work of others; stimulates discussion; provides ample citations for support of opinions; readily offers new interpretations of discussion material. Ideas are expressed clearly, concisely; uses appropriate vocabulary.
7-8	Shows evidence of understanding most major concepts; will offer an occasional divergent viewpoint or challenge; shows some skill in support for opinions. Some signs of disorganization with expression; transition wording may be faulty.
5-6	Has mostly shallow grasp of the material; rarely takes a stand on issue; offers inadequate levels of support. Poor language use garbles much of the message; only an occasional idea surfaces clearly; expression seems disjointed; overuse of the simple sentence and a redundancy with words and commentary; paragraphs often seem unrelated to each other. This student requires constant prompting for contributions.
1-4	A minimal posting of material. Shows no significant understanding of material. Language is mostly incoherent. Does not respond readily to prompting.

Hofmeister and Thomas (2005) offered an approach with some similarities to Bauer and Anderson (2000) but the rubric appeared less subjective and may have allowed instructors to easily modify it to meet specific needs. The three categories used in the rubric were thinking, writing, and participation. Within each of these headings lay individual examples of behavior, similar to the skills lists used by Bauer and Anderson. A difference was that on each of the examples of behavior, the student was ranked from a score of one (needs improvement) to a score of four (excellent). In the sample rubric, there were six behaviors under thinking, four under writing, and five under participation. Sub-scores of up to 24 points for thinking, up to 16 points for writing, and up to 20 points for participation are shown on the rubric grading sheet with a grand total of up to 60 points. The number of behaviors and their relative weight could be modified as desired by instructors wishing to use this rubric. Some example behaviors under thinking were: text-dependent summary expression, question asking, use of examples, acknowledgement of multiple perspectives or alternative viewpoints. The example behaviors listed under writing were similar to Bauer and Anderson's. Participation behaviors included: frequency, timing, responding to colleague's specific questions or providing feedback to colleagues.

Whereas Hofmeister and Thomas (2005) used three categories, Arnold and Ducate (2006) created a grading rubric based on the four following criteria: (1) theoretical knowledge; (2) connecting theory to their experiences, opinions, and comments; (3) interactivity; and (4) actively contributing to the discussion. Students could score up to ten points in each category making the total evaluation worth 40 points. Absent from the Arnold and Ducate model was criteria relating to correctness of writing.

Hawkes and Dennis (2003) proposed the use of a triangulation between self, peer, and instructor assessment. Using the rubric as self-assessment could introduce students to what was expected of them. Unlike the self0assessment which was informal and formative, the peer assessment was more formal and summative. In the Hawkes and Dennis model, students assessed each other based on all postings made by students in a particular conference. Students participated in multiple conferences, so ratings across conferences produced an aggregate score for each student. Peer assessments were also encouraged by Armstrong and Boud (1983), Changwatchia (2005), Dancer and Kamvounias (2005), Melvin and Lord (1995) and Zola (1992). Peer assessments can help assure group and individual accountability (Changwatchia) and serve as reliability checks (Dancer and Kamvounias).

The categories used in the Hawkes and Dennis (2003) rubric focused on reflective thinking, and ranged from level one to level seven. Similar to moving to a higher level of cognition, the foundation of Bloom's (1956) taxonomy, the levels of reflective thinking on the Hawkes and Dennis rubric move to increasingly higher levels of cognition. Level one was described as: no description of event; message un-related to practice. Level two was described as: events and experiences described in simple, layperson terms, generally unattached to classroom activities. The highest level (seven) was described as: explanation of events, experiences, or opinions that cites guiding principle and current context, while referencing moral and ethical issues. A beneficial feature of the Hawkes and Dennis rubric was a column titled "illustration" whereby sample text from hypothetical students represents the level of critical thinking that is expected at each level.

Webb, Jones, Barker, and Van Schiak (2004) provided a simple, three level rubric incorporating participation levels with the use of external references to provide a deeper level

of dialogue. To receive a pass level, the student needed to make at least one relevant contribution to each of three discussion forums. To receive a merit level, the student needed to meet the requirements of the pass level, plus have replied to and continued a conversation with an appropriate contribution and have referred to external sources. To receive a distinction level, the student needed to meet the requirements of the merit level and have referenced external sources and offered relevant comment on the content of the source. The reward for students who moved beyond personal opinions was evidenced in this rubric.

Evaluation of Whole-Class Discussion

The focus of the two preceding sections dealt with individual students, either in establishment of knowledge construction evidenced by content analysis or by more surface-level characteristics such as participation and engagement. Two scenarios may cause an instructor to have an interest in the nature of a composite discussion considering all students. Seasoned moderators may wish to reflect on their facilitation of a threaded discussion forum whereas inexperienced moderators may be seeking corrective action if the threaded discussion was off-track (Brace-Govan, 2003). Mason (1991) identified three functions in which discussion moderators should engage: (1) set the agenda for the electronic conference, (2) create a friendly environment for learning; and (3) focus discussion on critical points. The last item, “focus on critical points”, may be difficult for inexperienced moderators. Brace-Govan has developed a matrix for use in evaluating activity across the entire discussion forum.

In development of the Moderators’ Assessment Matrix, Brace-Govan (2003) drew on components of three previous models and then integrated them into a single matrix. Salmon (2000) identified five stages of contact through computer-mediated communication. The

stages were: (1) access and motivation; (2) online socialization; (3) information exchange; (4) knowledge construction; and (5) development. Although Tuckman's (1965) well-known model of small group formation far pre-dates online threaded discussion forums, group development behavior has been exhibited by online participants (McCreary, 1990), and therefore has a role in online threaded discussion forum evaluation. The four steps in the Tuckman model were as follows. One–forming: identify the task and group goals. Two–storming: group polarizes around key issues. Three–norming: cohesion through mutual support. Four–performing: positive interdependence is achieved. Finally, Gunawardena, Lowe, and Anderson (1997) identified five phases of interaction between students involved in online debate. The five stages of interaction in that model are: (1) sharing/comparing; (2) dissonance; (3) negotiation/co-construction; (4) testing tentative constructions; and (5) statement/application of newly constructed knowledge. Brace-Govan's (2003) Moderator's Assessment Matrix is summarized in Table 13 which follows. To properly utilize this form the moderators should mark activity levels of the various components with hash marks (where the form states: Record Activity Here) and may include special symbols such as ! or ? to indicate concerns or comments.

Table 13. *Brace-Govan's (2003) moderator's assessment matrix.*

Progressive Phases	**Conference Progress**	Record Activity Here	**Group Formation**	Record Activity Here	**Debate Development**	Record Activity Here
Technical connection to conference	Access and motivation Online socialization					
Phase one	Information exchange		Forming: identify the task and group goals		Sharing Comparing	
Phase two			Storming: group polarizes around key issues		Dissonance	
Phase three	Knowledge construction		Norming: cohesion through mutual support		Negotiation Co-construction	
Phase four	Development		Performing: positive interdependence is achieved		Testing tentative constructions	
Phase five					Statement Application of newly constructed knowledge	
Source	Solomon (2000)		Tuckman (1965)		Gunawardena et al. (1997)	

Moderators can use the form to compare multiple forums they are facilitating, current forums with previous ones they have facilitated or compare their forums with colleagues who were also using this instrument.

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